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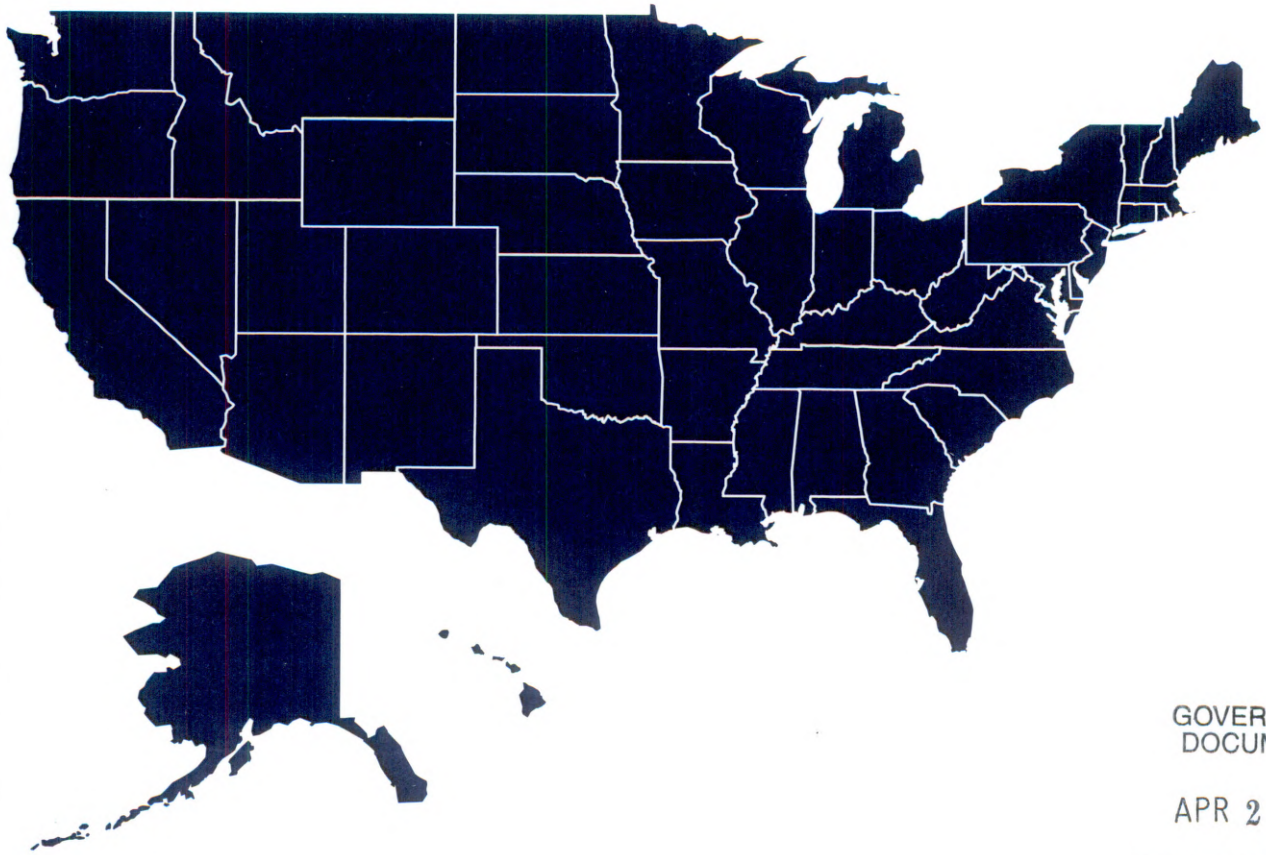
MINERALS YEARBOOK

Area Reports: Domestic 2004

Volume II



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U.S. Department of the Interior
U.S. Geological Survey

MINERALS YEARBOOK

Area Reports: Domestic 2004

Volume II

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U.S. DEPARTMENT OF THE INTERIOR
DIRK KEMPTHORNE, SECRETARY

U.S. GEOLOGICAL SURVEY
Mark D. Myers, Director

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industry during 2004 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 180 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Mark D. Myers, Director

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Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov/ or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, Minerals and Material Analysis Section, Minerals Information Team, via the Team Secretary, at (703) 648-4961. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals/.

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Acknowledgments

This volume was produced by Arnold O. Tanner and J. Roger Loebenstein, Physical Scientists with the Minerals Information Team of the U.S. Geological Survey (USGS). Domestic nonfuel mineral production data and tables were prepared by Stephen D. Smith, Industry Data Analyst; crushed stone data were prepared by Susan M. Weaver, Statistical Assistant; and construction sand and gravel data and tables were prepared by Cheryl J. Crawford, Statistical Assistant. All mineral commodity rankings and statistical analyses were performed by Mr. Tanner and were based on data reported to the USGS by companies responding to the annual canvasses of nonfuel mineral producers in the United States. **Note change:** Mineral production data and related rankings for the most recent year, 2004, are final, not preliminary as they were in the 1993-94 through 2003 editions of this publication. Data and related rankings prior to 2004 also are from final tabulations. For crushed stone and construction sand and gravel, each State chapter includes tabular 2002-04 data in more detail (kind of stone, use, aggregate district, etc.), where applicable, also based upon final data. Compilations of data contained in this volume were largely based on statistics and other data provided by the mineral industries. The USGS gratefully acknowledges the willing contribution of these essential data by both companies and individuals. Information regarding a State's mining industry, mineral exploration, and other mining-related activities or legislation was derived from information submitted by officials from each participating State. We thank those State agencies that contributed mining and minerals industry information for their States. Their submissions significantly broadened the scope of those chapters; their participation in this joint project is greatly appreciated. Authors of text submissions from participating States are referenced by footnote in each chapter as appropriate. All chapters underwent technical review by USGS mineral commodity specialists and other agency professionals. The melding of their knowledge and expertise into this project was invaluable in producing accurate individual documents and is greatly appreciated. Maps indicating "major producing areas" lead off each respective chapter; a chapter is included that lists with meanings the mineral symbols used in this volume. The State maps were updated and revised in collaboration with USGS mineral commodity specialists and State agencies.

In the collection of statistical and other mineral industry information, the USGS also was assisted by various State agencies through cooperative memoranda of understanding (MOUs). Some of the chapters in this publication were reviewed by staff members of these State agencies. Our sincere appreciation for all agency cooperation is extended to each State and Commonwealth government agency that has an MOU with the USGS. These are as follows:

Alabama: Geological Survey of Alabama.
Arizona: Arizona Department of Mines and Mineral Resources.
Arkansas: Arkansas Geological Commission.
California: California Geological Survey.
Colorado: Colorado Geological Survey.
Connecticut: Connecticut Geological and Natural History Survey.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Georgia Department of Natural Resources, Georgia Geologic Survey.
Hawaii: Hawaii Department of Land and Natural Resources, Commission of Water Resources Management.
Idaho: Idaho Geological Survey.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Geological Survey.
Iowa: Iowa Geological Survey and Land Quality Bureau.
Kansas: Kansas Geological Survey.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Maine Geological Survey.
Maryland: Maryland Department of the Environment, Minerals, Oil, and Gas Division.
Michigan: Michigan Department of Environmental Quality, Office of Geological Survey.
Mississippi: Mississippi Department of Environmental Quality, Office of Geology.
Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey.
Montana: Montana Bureau of Mines and Geology.
Nebraska: University of Nebraska-Lincoln, Nebraska Conservation and Survey Division.
Nevada: Nevada Bureau of Mines and Geology.
New Hampshire: New Hampshire Geological Survey.
New Jersey: New Jersey Geological Survey.

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New Mexico: New Mexico Bureau of Geology and Mineral Resources.
New York: New York State Geological Survey.
North Carolina: North Carolina Geological Survey.
North Dakota: North Dakota Geological Survey.
Ohio: Ohio Department of Natural Resources, Division of Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Pennsylvania: Pennsylvania Bureau of Topographic and Geologic Survey.
Puerto Rico: Puerto Rico Department of Natural and Environmental Resources, Division of Geology.
South Carolina: South Carolina Geological Survey.
South Dakota: South Dakota Geological Survey.
Tennessee: Tennessee Department of Environment and Conservation, Division of Geology.
Texas: The University of Texas at Austin, Bureau of Economic Geology.
Utah: Utah Geological Survey.
Vermont: Vermont Geological Survey.
Virginia: Virginia Department of Mines, Minerals and Energy.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological and Natural History Survey.
Wyoming: Wyoming State Geological Survey.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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Survey Methods for Nonfuel Minerals

By Jeffrey P. Busse

The U.S. Geological Survey (USGS) collects worldwide data on virtually every commercially important nonfuel mineral commodity. These data form the basis for tracking and assessing the health of the minerals sector of the U.S. economy.

The USGS data collection activity was instituted by the 47th Congress in the appropriations act of August 7, 1882 (22 Stat. 329), which placed the collection of mineral statistics on an annual basis. The most recent authority for the USGS survey activity is the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96-479, 94 Stat. 2305). The Act included provisions to strengthen protection for proprietary data provided to the U.S. Department of the Interior by persons or firms engaged in any phase of mineral or mineral-material production or consumption.

Data Collection Surveys

The USGS begins the collection of domestic nonfuel minerals and materials statistics by appraising the information requirements of Government and private organizations of the United States. Requirements that can be met by collecting data from minerals establishments are posed as questions on USGS surveys. Figure 1 shows a typical survey form.

Specific questions about mineral commodity activities, such as production, consumption, and shipments, are structured in the survey forms to provide meaningful aggregated data. Thus, the entire mineral economic cycle from production through consumption is covered by 140 monthly, quarterly, semiannual, and annual surveys.

After the survey form has been designed, a list of the appropriate establishments to be canvassed is developed. Many sources are used to determine which companies, mines, plants, and other operations should be included on the survey mailing list. State geologists, Federal organizations (such as the Mine Safety and Health Administration), trade associations, industry representatives, and trade publications and directories are some of the sources that are used to develop and update survey listings. With few exceptions, a complete canvass of the list of establishments is used rather than a sample survey. The iron and steel scrap industry is one of the exceptions where a sample survey is conducted.

The Paperwork Reduction Act requires that any Government agency that wants to collect information from 10 or more individuals or establishments must first obtain approval from the Office of Management and Budget (OMB), which approves the need to collect the data and protects industry from unwarranted Government paperwork. This approval is indicated by the OMB Control Number on the survey forms (fig. 1).

Survey Processing

The USGS surveys approximately 20,000 establishments. Each year, the USGS mails about 34,000 forms for 140 different surveys. Each completed survey form returned to the USGS undergoes extensive analysis, including computerized checks, to ensure the highest possible accuracy of the mineral data. The statistical staff monitors all surveys to ensure that errors are not created by reporting in physical units different from the units requested on the form. Relations between associated measures, such as produced crude ore and marketable crude ore, are analyzed for consistency. Engineering variables, such as recovery factors from ores and concentrates, also are used. The totals for each form are verified, and currently reported data are checked against prior reports to detect possible errors or omissions.

The USGS is also developing an Internet-based electronic forms system as required by the Government Paperwork Elimination Act. This electronic system is designed to speed the collection and analysis of minerals information. As of December 2004, 14 canvass forms, accounting for 58% of annual responses, were available electronically.

Survey Responses.—To enable the reader to better understand the basis on which the statistics are calculated, each mineral commodity chapter includes a section about domestic data coverage. This section briefly describes the data sources, the number of establishments surveyed, the response percentage, and the method of estimating the production or consumption for nonrespondents.

To produce reliable aggregated data, the USGS uses efficient procedures for handling instances of nonresponse. Failure to respond to the initial survey form results in a second request, either a second mailing of the paper form or an e-mail in the case of electronic respondents. If the second request does not produce a response, then telephone calls are made to the nonrespondents. The followup calls provide the necessary data to complete the survey forms and/or to verify questionable data entries. Periodic visits to mineral establishments also are made by USGS mineral commodity specialists to gather missing data and to explain the importance of the establishment's reporting. By describing the use of the published statistics and showing the impact of nonresponse, the USGS strives to encourage respondents to give complete and accurate replies.

The OMB publication "Guidelines for Reducing Reporting Burden" stipulates that the minimum acceptable response rate is 75% of the panel surveyed. In addition, the USGS strives for a minimum reporting level of 75% of the quantity produced or consumed (depending on the survey) for certain key statistics. Response rates are periodically reviewed. For those surveys that do not meet the minimum reporting level, procedures are developed and implemented to improve response rates.

Estimation for Nonresponse.—When efforts to obtain a response to a survey fail, estimation or imputation techniques must be used to account for missing data. Some of the estimation methods depend on knowledge of prior establishment reporting; other techniques rely on external information to

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estimate the missing data. When survey forms are received after the current publication has been completed, the forms are reviewed, necessary imputations are made for missing data, and the survey database is updated. The revised data are reported in later publications.

Protection of Proprietary Data.—The USGS relies on the cooperation of the U.S. minerals industry to provide the mineral data that are presented in this and other USGS minerals information publications. Without a strong response to survey requests, the USGS would not be able to present reliable statistics. The USGS, in turn, respects the proprietary nature of the data received from the individual companies and establishments. To ensure that proprietary rights will not be violated, the USGS analyzes each of the aggregated statistics to determine if the data reported by an individual establishment can be deduced from the aggregated statistics. If, for example, there are only two significant producers of a mineral commodity in a given State, then the USGS will not publish the State total because either producer could readily estimate the production of the other. It is this obligation to protect proprietary information that results in the withheld, or W, entries in the published tables. If a company gives permission in writing, however, then the USGS will publish the data as long as the data from other respondents are protected from disclosure.

International Data

International data are collected by USGS country specialists and international data coordinators. The data are gathered from various sources, which include published reports of foreign Government mineral and statistical agencies, international organizations, the U.S. Department of State, the United Nations, the Organization of the Petroleum Exporting Countries, and personal contact by specialists traveling abroad. Each February, minerals questionnaires are sent to foreign organizations requesting estimates of mineral production for the country for the preceding year. Missing data are estimated by USGS country specialists on the basis of historical trends and the specialist's knowledge of current production capabilities in each country.

Publications

The USGS disseminates current and historical minerals information through printed publications and its Web site.

Printed Publications.—The Minerals Yearbook summarizes annually, on a calendar-year basis, the significant economic and technical developments in the mineral industries. Three volumes are issued each year—volume I, Metals and Minerals; volume II, Area Reports: Domestic; and volume III, Area Reports: International. Volume I presents, by mineral commodity, salient statistics on production, trade, consumption, reserves, and other measures of economic activity. Volume II reviews the U.S. minerals industry by State and island possessions. Volume III is published as four separate regional reports that cover more than 175 foreign countries. These reports contain individual country chapters that examine the mining, refining, processing, and use of minerals in each country in the region and how they relate to U.S. industry.

The Mineral Commodity Summaries (MCS), which is an up-to-date summary of about 80 nonfuel mineral commodities, is the earliest Government publication to furnish estimates that cover the previous year's nonfuel mineral industry data. It contains information on the domestic industry structure, Government programs, tariffs, 5-year salient domestic statistics, and a summary of significant events, trends, and issues in the international minerals industry during the past year.

The Minerals Yearbook and the MCS may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone, (202) 512-1800 or (866) 512-1800 (toll-free); Internet, http://bookstore.gpo.gov.

Electronic Publications.—In addition to USGS printed publications, the USGS disseminates current and historical minerals information through its Web site at URL http://minerals.usgs.gov/minerals. All minerals information publications from 1996 to the present are available to view or download. The Web site also provides information on other products as well as contacts for minerals information and links to other mineral-related sites on the Internet.

Mineral Industry Surveys (MIS) contain timely statistical and economic data on minerals. The surveys are designed to keep Government agencies and the public, particularly the mineral industry and the business community, informed of trends in the production, distribution, inventories, and consumption of minerals. Frequency of issue depends on the demand for current data. The MIS are released monthly, quarterly, semiannually, or annually.

Metal Industry Indicators, which are published monthly, contain indexes that measure the current and future performance of five U.S. metal industries. For each of the five industries, a composite coincident index and a composite leading index have been developed based on procedures and data similar to those used to construct the Conference Board's coincident and leading cyclical indicators for the national economy. Leading and coincident indexes for the nonmetallic mineral products industry, which measure the current and future performance of the industrial minerals industry, also are published monthly. The indexes were designed by using the same procedures as the USGS metal composite indexes.

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FIGURE 1
A TYPICAL SURVEY FORM

USGS Form 9-4045-M
Fer. (rev. 2/18/2005)

OBM Control No. 1028-0068
Approval expires: 1/31/2008

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A03

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DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
986 NATIONAL CENTER
RESTON, VIRGINIA 20192

IRON ORE (Usable ore)

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Unless authorization is granted in the section above the signature, the data furnished in this report will be treated in confidence by the Department of the Interior, except that they may be disclosed to Federal defense agencies, or to the Congress upon official request for appropriate purposes. Unless objection is made in writing to the USGS, the information furnished in this report may be disclosed to the respondent's State Geological Survey (or similar State Agency) if the State has appropriate safeguards to prevent disclosing company proprietary data.

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(Please correct if name or address has changed.)

Public voluntary reporting burden for this collection of information is estimated to average 30 MINUTES per response. A Federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Comments regarding this collection of information should be directed to: U.S. Geological Survey, Statistics and Information Systems Section, 988 National Center, Reston, VA 20192. **Please do not mail survey forms to this address.**

Collection of nonfuel minerals information is authorized by Public Law 96-479 and the Defense Production Act. This information is used to support executive policy decisions pertaining to emergency preparedness, national defense, and analyses for minerals legislation and industrial trends. The USGS relies on your voluntary and timely response to assure that its information is complete and accurate.

Please return this form in the enclosed envelope or fax to the above toll-free number by the **15TH OF THE MONTH** following the reporting period. Complete a separate form for each mineral establishment that was active during the reporting period. A minerals establishment is defined as a single physical location where mineral operations are conducted; for example, a mine only, a mine and preparation plant, or a preparation plant only. If you do not have exact data, please enter your best estimates and mark with an /e. Use zero (0) when appropriate. Do not report decimals or fractions. Round to the nearest whole number. If you have nothing to report, please complete Section 1, sign, and return the form. Please use the space for "Remarks" to provide any specific information that will help us in the use or interpretation of the data. Any statement on the effect of changes in economic conditions upon the reporting establishment will be useful. Additional forms are available upon request.

If you have any questions concerning completion of this form, please contact the Mineral Commodities Data Unit, U.S. Geological Survey, 985 National Center, Reston, VA 20192, Telephone (703) 648-7960.

SECTION 1. Mine or group covered by this report.

Name _____ State _____ County _____

SECTION 2. Stocks, production, and shipments of usable ore for the report month.
Report only ore products as shipped to consumer, such as direct-shipping ore, concentrate, or agglomerates.
Report ores produced in the United States only; do not include imports.

Usable ore (1)	Code	Weight unit Mark (X) one (2)		Physical inventory Adjustment only (3)	Beginning stocks (4)	Production (5)	Shipments (6)	Ending stocks (7)
		Long tons (4)	Metric tons (6)					
Iron ore (containing less than 5% Mn, natural.....	201							

SECTION 3. Please indicate any mines opened or closed by your company during the month.

Remarks:

Name of person to be contacted regarding this report		Tel. area code	No.	Ext.
Address No. Street	City		State	ZIP Code

May tabulations be published which could indirectly reveal the data reported above? ☒ (1) Yes ☒ (2) No

Signature	Title	Date

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STATISTICAL SUMMARY

By Stephen D. Smith

This annual report summarizes data on crude nonfuel mineral production[1] for the United States, its island possessions, and the Commonwealth of Puerto Rico.

Although crude mineral production may be measured at any of several stages of extraction and processing, the stage of measurement used in this annual report is what is termed "mine output." This term refers to minerals or ores in the form in which they are first extracted from the ground, but customarily may include the output from auxiliary processing at or near the mines.

[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 U.S. Geological Survey (USGS) mineral production data published in this chapter are as of May 2006. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Specialist contact information are available on the Internet at http://minerals.usgs.gov/minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—are also available on the Internet at http://minerals.usgs.gov/minerals.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. For copper, gold, lead, silver, and zinc, the quantities listed are recorded on a mine basis (as the recoverable content of ore sold or treated). The values assigned to the quantities, however, are based on the average selling price of refined metal, not the mine value.

The total value of all nonfuel mineral production in the United States in 2004 increased to $45.7 billion, which was a increase of more than 15% compared with that of 2003; metals increased to $12.5 billion, which was a increase of 41%; and industrial minerals increased to $33.2 billion, slightly more than 8%.

In 2004, the value of nonfuel mineral commodity production for the following nine commodities, in descending order of production value, was greater than $1 billion: stone (crushed), cement (portland), sand and gravel (construction), copper, gold, iron ore (usable), molybdenum concentrates, lime, and salt. They accounted for more than 79% of the U.S. total production value (table 1).

In 2004, the value of nonfuel mineral commodity production in the following 17 States, in descending order of production value, was greater than $1 billion: California, Nevada, Arizona, Florida, Texas, Utah, Minnesota, Georgia, Michigan, Missouri, Pennsylvania, Alaska, Ohio, New York, Illinois, Wyoming, and Colorado. They accounted for almost 70% of the U.S. total production value (table 3).

TABLE 1
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Metals:							
Beryllium concentrates	metric tons	1,970	NA	2,100	NA	2,210	NA
Copper[3]		1,140	1,910,000	1,120	2,100,000	1,160	3,420,000
Gold[3]	kilograms	298,000	2,980,000	277,000	3,250,000	258,000	3,400,000
Iron ore, usable		51,500	1,340,000	46,100 r	1,490,000 r	54,900	2,080,000
Iron oxide pigments, crude	metric tons	53,200	1,070	50,900	814	W	W
Lead[3]	do.	440,000	423,000	449,000	433,000	430,000	523,000
Molybdenum concentrates[4,5]	do.	32,300	232,000	33,600	324,000	42,000	1,420,000
Palladium[4]	kilograms	14,800	162,000	14,000	91,400	13,700	102,000
Platinum[4]	do.	4,390	76,500	4,170	93,100	4,040	110,000
Rare-earth metal concentrates[4]	metric tons	5,000 e	27,600 e	--	--	--	--
Silver[3]	kilograms	1,420,000	211,000	1,240,000	196,000	1,250,000	268,000
Zinc[3]	metric tons	780,000	664,000	738,000	661,000	715,000	827,000
Combined value of magnesium metal, titanium concentrates, zirconium concentrates, and value indicated by symbol W		XX	229,000	XX	233,000	XX	301,000
Total		XX	8,260,000	XX	8,860,000 r	XX	12,500,000
Industrial minerals, excluding fuels:							
Asbestos	metric tons	2,720	1,380	--	--	--	--
Barite		420	12,200	468	13,900	532	18,700
Boron		1,050	513,000	1,150	591,000	1,210	626,000

See footnotes at end of table.

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TABLE 1—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Industrial minerals, excluding fuels—Continued:							
Bromine	metric tons	222,000	166,000	216,000	155,000	222,000	191,000
Cement:							
Masonry		4,450	480,000 e	4,740	468,000 e	5,000	585,000 e
Portland		85,300	6,350,000 e	88,100	6,460,000 e	92,400	7,110,000 e
Clays:							
Ball		1,120	47,000	1,310	56,200	1,220	54,100
Bentonite		3,970	180,000	3,940	177,000	4,060	179,000
Common		23,000	148,000	23,100	131,000	24,600	157,000
Fire		446	10,500	400	10,200	256	7,870
Fuller's earth		2,730	246,000	3,600	332,000	3,260	329,000
Kaolin		8,010	951,000	7,680	939,000	7,760	945,000
Diatomite		624	159,000	599 r	159,000 r	620	177,000
Feldspar		790	42,800	800	43,400	770	44,200
Garnet, industrial	metric tons	38,500	4,500	29,200	3,170	28,400	3,050
Gemstones, natural		NA	12,600	NA	12,500	NA	14,500
Gypsum, crude		15,700	108,000	16,700	114,000	17,200	124,000
Helium:							
Crude	million cubic meters	50	63,600	49	67,000	57	77,500
Grade-A	do.	127	293,000	122	282,000	130	299,000
Iodine	metric tons	1,420	21,600	1,090	15,900	W	W
Kyanite[e]		90	13,400	90	13,400	90	13,400
Lime		17,900	1,120,000	W	W	20,000	1,370,000
Mica, crude		81	7,340	79	16,700	99,200	15,400
Peat		728	21,000	632	18,800	741,000	21,200
Perlite, crude	metric tons	521,000	19,000	493,000	18,800	508,000	20,600
Phosphate rock, marketable		36,100	993,000	35,000	946,000	35,800	995,000
Potash		2,600	280,000	2,500	280,000	2,700	340,000
Pumice and pumicite	metric tons	950,000	22,900	870,000	21,900	1,490,000	25,000
Salt		37,700	1,010,000	41,100	1,130,000	45,000	1,270,000
Sand and gravel:							
Construction		1,130,000	5,750,000	1,160,000	5,990,000	1,240,000	6,590,000
Industrial		27,200	572,000	27,500	609,000	29,700	685,000
Silica stone[6]	metric tons	386	3,740	513	3,630	655	3,660
Soda ash		10,500	784,000	10,600	765,000	11,000	770,000
Stone, crushed[7]		1,510,000	8,650,000	1,530,000	9,060,000 r	1,590,000	9,590,000
Tripoli	metric tons	66,600	16,600	68,800	17,700	94,000	19,400
Zeolites	do.	(8)	NA	(8)	NA	W	W
Combined value of brucite, emery (2002), greensand marl, lithium carbonate, magnesite, magnesium compounds, olivine, pyrophyllite (crude), staurolite, stone (dimension), talc (crude), vermiculite (crude), wollastonite, and values indicated by symbol W		XX	523,000	XX	1,800,000	XX	531,000
Total		XX	29,600,000	XX	30,700,000 r	XX	33,200,000
Grand total		XX	37,900,000	XX	39,600,000 r	XX	45,700,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value."
XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Content of ore and concentrate.

[5]Shipments.

[6]Includes grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

[7]Excludes abrasive stone and bituminous limestone and sandstone; all included elsewhere in table.

[8]Withheld to avoid disclosing company proprietary data.

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TABLE 2

NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 2004

(Principal States based on quantity unless otherwise noted)

Mineral	Principal States	Other States (alphabetical order)
Barite	NV and GA	
Beryllium concentrates	UT	
Boron	CA	
Bromine	AR and MI	
Brucite	NV and TX	
Cement:		
Masonry	FL, CA, SC, IN, AL	AZ, AR, CO, GA, IA, KS, KY, ME, MD, MI, MO, NE, NM, NY, OH, OK, PA, TN, TX, VA, WV.
Portland	CA, TX, PA, MI, MO	All other States, except AK, CT, DE, HI, LA, MA, MN, NH, NJ, NC, ND, RI, VT.
Clays:		
Ball	TN, TX, MS, KY, IN	
Bentonite	WY, MS, MT, AL, UT	AZ, CA, CO, NV, OR, TX, VA.
Common	NC, TX, AL, GA, OH	All other States, except AK, DE, HI, ID, NV, NH, RI, VT, WI.
Fire	MO, OH, SC	
Fuller's earth	GA, MO, MS, VA, FL	CA, IL, KS, NV, TN, TX.
Kaolin	GA, AL, SC, AR, TX	CA, FL, NV, NC, TN.
Copper[1]	AZ, UT, NM, MT, NV	ID and MO.
Diatomite	CA, NV, OR, WA	
Feldspar	NC, VA, CA, OK, GA	ID and SD.
Garnet, industrial	NY and ID	
Gemstones, natural[2]	TN, AZ, OR, CA, ID	All other States.
Gold[1]	NV, AK, UT, CO, CA	AZ, MT, NM, SD, WA.
Greensand marl	NJ	
Gypsum, crude	OK, TX, NV, IA, CA	AZ, AR, CO, IN, KS, LA, MI, NM, SD, UT, WY.
Helium:		
Crude	KS and TX	
Grade-A	KS, WY, OK, OH, UT	NM and TX.
Iodine, crude	OK	
Iron ore, usable	MN, MI, CA	
Iron oxide pigments, crude	GA, MI, AL, VA	
Kyanite	VA	
Lead[1]	MO, AK, ID, WA, MT	
Lime	MO, KY, AL, OH, TX	All other States, except AK, CT, DE, HI, KS, ME, MD, MS, NH, NJ, NY, NC, RI, SC, VT.
Lithium carbonate	NV	
Magnesite	NV	
Magnesium compounds	MI, FL, UT, DE, CA	
Magnesium metal	UT	
Mica, crude	NC, NM, GA, SD, SC	
Molybdenum, concentrates	AZ, CO, UT, ID, MT	NM.
Olivine	WA and NC	
Palladium[1]	MT	
Peat	FL, MI, MN, IL, PA	IN, IA, ME, MT, NJ, NY, OH, WA, WV, WI.
Perlite, crude	NM, OR, AZ, UT, CA	ID and NV.
Phosphate rock	FL, ID, NC, UT	
Platinum[1]	MT	
Potash	NM, UT, MI	
Pumice and pumicite	OR, AZ, ID, NM, CA	KS.
Pyrophyllite, crude	NC	
Salt	LA, TX, NY, OH, KS	AL, AZ, CA, MI, NV, NM, OK, TN, UT, WV.
Sand and gravel:		
Construction	CA, TX, AZ, MI, MN	All other States.
Industrial	IL, TX, WI, NJ, CA	All other States, except AK, CT, DE, HI, KY, ME, MA, MT, NH, NM, OR, SD, UT, VT, WY.
Silica stone[3]	AR	
Silver[1]	AK, NV, ID, UT, MT	AZ, CA, CO, MO, NM, WA.
Soda ash	WY, CA, CO	
Staurolite	FL	

See footnotes at end of table.

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TABLE 2—Continued
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 2004

(Principal States based upon quantity unless otherwise noted)

Mineral	Principal States	Other States (alphabetical order)
Stone:		
Crushed	TX, PA, FL, GA, IL	All other States, except DE.
Dimension	IN, WI, GA, VT, MA	All other States, except AK, DE, FL, HI, IL, IA, KY, LA, MS, NE, NV, NJ, ND, OR, RI,WY.
Talc, crude	MT, TX, VT, NY, CA	OR.
Titanium concentrates:		
Ilmenite	FL, VA, GA	
Rutile	FL	
Tripoli	IL, OK, AR, PA	
Vermiculite, crude	SC and VA	
Wollastonite	NY	
Zeolites	NM, ID, TX, AZ, NV	WY and CA.
Zinc[1]	AK, MO, WA, MT, TN	ID.
Zirconium concentrates	FL, VA, GA	

[1]Content of ores, etc.

[2]Principal producing States based on value.

[3]Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

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TABLE 3

VALUE OF NONFUEL MINERAL PRODUCTION IN THE UNITED STATES AND PRINCIPAL NONFUEL MINERALS PRODUCED IN 2004[1]

State	Value (thousands)	Rank	Percentage of U.S. total	Principal minerals, in order of value
Alabama	$972,000	18	2.13	Cement (portland), stone (crushed), lime, sand and gravel (construction), cement (masonry).
Alaska	1,270,000	12	2.78	Zinc, lead, gold, silver, sand and gravel (construction).
Arizona	3,330,000	3	7.30	Copper, sand and gravel (construction), molybdenum concentrates, cement (portland), stone (crushed).
Arkansas	518,000	29	1.13	Bromine, stone (crushed), cement (portland), sand and gravel (construction), lime.
California	3,760,000	1	8.23	Sand and gravel (construction), cement (portland), boron minerals, stone (crushed), diatomite.
Colorado	1,010,000	17	2.21	Molybdenum concentrates, sand and gravel (construction), cement (portland), gold, stone (crushed).
Connecticut[2]	131,000	42	0.29	Stone (crushed), sand and gravel (construction), stone (dimension), clays (common), gemstones (natural).
Delaware[2]	21,900	50	0.05	Sand and gravel (construction), magnesium compounds, gemstones (natural).
Florida	2,320,000	4	5.08	Phosphate rock, stone (crushed), cement (portland), sand and gravel (construction), cement (masonry).
Georgia	1,800,000	8	3.95	Clays (kaolin), stone (crushed), clays (fuller's earth), cement (portland), sand and gravel (construction).
Hawaii	71,200	46	0.16	Stone (crushed), sand and gravel (construction), gemstones (natural).
Idaho	446,000	34	0.98	Molybdenum concentrates, phosphate rock, sand and gravel (construction), silver, cement (portland).
Illinois	1,050,000	15	2.31	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), lime.
Indiana	764,000	22	1.67	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Iowa	529,000	28	1.16	Stone (crushed), cement (portland), sand and gravel (construction), gypsum (crude), lime.
Kansas	754,000	23	1.65	Cement (portland), helium (Grade-A), salt, stone (crushed), helium (crude).
Kentucky	648,000	25	1.42	Stone (crushed), lime, cement (portland), sand and gravel (construction), clays (ball).
Louisiana	356,000	36	0.78	Salt, sand and gravel (construction), stone (crushed), sand and gravel (industrial), clays (common).
Maine	118,000	43	0.26	Sand and gravel (construction), cement (portland), stone (crushed), stone (dimension), cement (masonry).
Maryland	481,000	32	1.05	Stone (crushed), cement (portland), sand and gravel (construction), stone (dimension), cement (masonry).
Massachusetts[2]	210,000	38	0.46	Stone (crushed), sand and gravel (construction), lime, stone (dimension), clays (common).
Michigan	1,670,000	9	3.66	Iron ore (usable), cement (portland), sand and gravel (construction), salt, stone (crushed).
Minnesota[2]	1,890,000	7	4.13	Iron ore (usable), sand and gravel (construction), stone (crushed), sand and gravel (industrial), stone (crushed).
Mississippi	194,000	40	0.43	Sand and gravel (construction), clays (fuller's earth), stone (crushed), cement (portland), clays (bentonite).
Missouri	1,470,000	10	3.23	Stone (crushed), cement (portland), lead, lime, sand and gravel (construction).
Montana	624,000	26	1.37	Platinum metal, palladium metal, copper, molybdenum concentrates, sand and gravel (construction).
Nebraska[2]	106,000	44	0.23	Cement (portland), sand and gravel (construction), stone (crushed), cement (masonry), lime.
Nevada	3,470,000	2	7.60	Gold, sand and gravel (construction), lime, stone (crushed), silver.
New Hampshire[2]	70,600	47	0.16	Sand and gravel (construction), stone (crushed), stone (dimension), gemstones (natural).
New Jersey[2]	341,000	37	0.75	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), greensand marl, peat.
New Mexico	866,000	20	1.90	Copper, potash, sand and gravel (construction), molybdenum (concentrates), cement (portland).
New York	1,110,000	14	2.43	Stone (crushed), salt, cement (portland), sand and gravel (construction), wollastonite.
North Carolina	805,000	21	1.76	Stone (crushed), phosphate rock, sand and gravel (construction), sand and gravel (industrial), feldspar.
North Dakota	44,500	48	0.10	Sand and gravel (construction), lime, stone (crushed), clays (common), sand and gravel (industrial).
Ohio	1,120,000	13	2.45	Stone (crushed), sand and gravel (construction), salt, lime, cement (portland).
Oklahoma	507,000	31	1.11	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), gypsum (crude).
Oregon	367,000	35	0.80	Stone (crushed), sand and gravel (construction), cement (portland), diatomite, lime.
Pennsylvania	1,400,000	11	3.08	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Rhode Island[2]	34,400	49	0.08	Sand and gravel (construction), stone (crushed), sand and gravel (industrial), gemstones (natural).
South Carolina[2]	532,000	27	1.17	Stone (crushed), cement (portland), cement (masonry), sand and gravel (construction), clays (kaolin).
South Dakota	210,000	39	0.46	Cement (portland), sand and gravel (construction), gold, stone (crushed), stone (dimension).
Tennessee	653,000	24	1.43	Stone (crushed), cement (portland), sand and gravel (construction), clays (ball), sand and gravel (industrial).
Texas	2,290,000	5	5.01	Cement (portland), stone (crushed), sand and gravel (construction), salt, lime.
Utah	1,940,000	6	4.26	Copper, molybdenum (concentrates), cement (portland), gold, sand and gravel (construction).
Vermont[2]	85,400	45	0.19	Stone (crushed), stone (dimension), sand and gravel (construction), talc (crude), gemstones (natural).
Virginia	894,000	19	1.96	Stone (crushed), cement (portland), sand and gravel (construction), lime, zirconium (concentrates).
Washington	507,000	30	1.11	Sand and gravel (construction), cement (portland), stone (crushed), gold, zinc.
West Virginia	167,000	41	0.37	Stone (crushed), cement (portland), sand and gravel (industrial), lime, cenent (masonry).
Wisconsin[2]	470,000	33	1.03	Sand and gravel (construction), stone (crushed), lime, sand and gravel (industrial), stone (dimension).
Wyoming	1,040,000	16	2.29	Soda ash, clays (bentonite), helium (Grade-A), cement (portland), sand and gravel (construction).
Undistributed	197,000	XX	0.43	
Total	45,700,000	XX	100.00	

XX Not applicable.

[1]Data are rounded to three significant digits: may not add to totals shown.

[2]Partial total; excludes values that must be withheld to avoid disclosing company proprietary data which are values included with "Undistributed."

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TABLE 4

VALUE OF NONFUEL MINERAL PRODUCTION PER CAPITA AND PER SQUARE KILOMETER IN 2004 BY STATE[1]

State	Area (square kilometers)	Population (thousands)	Total value (thousands)	Per capita		Per square kilometer	
				Dollars	Rank	Dollars	Rank
Alabama	134,000	4,560	$972,000	$213	14	$7,260	20
Alaska	1,530,000	664	1,270,000	1,910	2	828	48
Arizona	295,000	5,940	3,330,000	561	6	11,300	7
Arkansas	138,000	2,780	518,000	186	16	3,760	29
California	411,000	36,100	3,760,000	104	28	9,140	13
Colorado	270,000	4,670	1,010,000	217	13	3,750	30
Connecticut	13,000	3,510	131,000 [2]	37	47	10,100	11
Delaware	5,290	844	21,900 [2]	26	50	4,140	27
Florida	152,000	17,800	2,320,000	130	22	15,300	3
Georgia	153,000	9,070	1,800,000	199	15	11,800	6
Hawaii	16,800	1,280	71,200	56	44	4,250	26
Idaho	216,000	1,430	446,000	312	9	2,060	42
Illinois	146,000	12,800	1,050,000	83	37	7,220	21
Indiana	93,700	6,270	764,000	122	24	8,160	18
Iowa	146,000	2,970	529,000	178	17	3,630	31
Kansas	213,000	2,740	754,000	275	10	3,540	32
Kentucky	105,000	4,170	648,000	155	19	6,190	23
Louisiana	124,000	4,520	356,000	79	38	2,880	36
Maine	86,200	1,320	118,000	89	34	1,370	46
Maryland	27,100	5,600	481,000	86	35	17,800	1
Massachusetts	21,500	6,400	210,000 [2]	33	48	9,800	12
Michigan	152,000	10,100	1,670,000	165	18	11,000	8
Minnesota	219,000	5,130	1,890,000 [2]	367	8	8,630	16
Mississippi	124,000	2,920	194,000	67	41	1,570	44
Missouri	181,000	5,800	1,470,000	254	12	8,170	19
Montana	381,000	936	624,000	667	5	1,640	43
Nebraska	200,000	1,760	106,000 [2]	60	42	529	49
Nevada	286,000	2,410	3,470,000	1,440	3	12,100	4
New Hampshire	24,000	1,310	70,600 [2]	54	45	2,940	37
New Jersey	20,200	8,720	341,000 [2]	39	46	16,900	2
New Mexico	315,000	1,930	866,000	449	7	2,750	40
New York	127,000	19,300	1,110,000	58	43	8,730	15
North Carolina	136,000	8,680	805,000	93	32	5,900	25
North Dakota	183,000	637	44,500	70	40	243	50
Ohio	107,000	11,500	1,120,000	97	31	10,400	10
Oklahoma	181,000	3,550	507,000	143	20	2,800	39
Oregon	251,000	3,640	367,000	101	29	1,460	45
Pennsylvania	117,000	12,400	1,400,000	113	26	12,000	5
Rhode Island	3,140	1,080	34,400 [2]	32	49	11,000	9
South Carolina	80,600	4,260	532,000 [2]	125	23	6,610	22
South Dakota	200,000	776	210,000	271	11	1,050	47
Tennessee	109,000	5,960	653,000	109	27	5,980	24
Texas	691,000	22,900	2,290,000	100	30	3,310	34
Utah	220,000	2,470	1,940,000	788	4	8,840	14
Vermont	24,900	623	85,400 [2]	137	21	3,430	33
Virginia	106,000	7,570	894,000	118	25	8,470	17
Washington	176,000	6,290	507,000	81	39	2,870	38
West Virginia	62,800	1,820	167,000	92	33	2,660	41
Wisconsin	145,000	5,540	470,000 [2]	85	36	3,230	35
Wyoming	253,000	509	1,040,000	2,050	1	4,120	28
Undistributed	XX	XX	197,000	XX	XX	XX	XX
Total or average	9,370,000 [3]	296,000 [3]	45,700,000	154	XX	4,870	XX

XX Not applicable.

[1]Data are rounded to three significant digits; may not add to totals shown.

[2]Partial total; excludes values that must be withheld to avoid disclosing company proprietary data, which are included with "Undistributed."

[3]Excludes Washington, DC (which has no mineral production), with an area of 179 square kilometers and a population of 551,000.

Sources: U.S. Geological Survey and U.S. Census Bureau.

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TABLE 5

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Alabama:							
Cement:							
Masonry		380	42,000 e	565	55,700 e	430	49,400 e
Portland		4,540	298,000 e	4,330	273,000 e	4,800	320,000 e
Clays:							
Bentonite		125	3,810	125	3,810	100	3,050
Common		2,020	24,600	1,920	24,000	2,120	29,600
Kaolin		531	14,600	W	W	W	W
Gemstones		NA	356	NA	356	NA	356
Lime		2,040	127,000	2,290	151,000	2,280	164,000
Sand and gravel:							
Construction		12,500	56,700	14,500	67,600	14,700	65,300
Industrial		722	8,990	723	9,180	643	9,800
Stone, crushed		43,400	257,000 r	49,300	286,000	49,100	303,000
Combined values of iron oxide pigments (crude), salt, stone (dimension marble and sandstone), and values indicated by symbol W		XX	8,850	XX	30,000	XX	27,000
Total		XX	843,000 r	XX	900,000	XX	972,000
Alaska:							
Gemstones		NA	12	NA	12	NA	12
Gold[3]	kilograms	16,900	170,000	W	W	W	W
Sand and gravel, construction		16,300	93,400	9,980	55,700	9,430	51,600
Silver[3]	kilograms	559,000	83,100	W	W	W	W
Stone, crushed[4]		2,810 r	15,200 r	2,640	15,300	2,230	13,900
Combined values of lead, stone [crushed dolomite, granite, limestone, shell (2002), crushed granite and shell (2003-04)], zinc, and values indicated by symbol W		XX	695,000 r	XX	1,010,000	XX	1,200,000
Total		XX	1,060,000 r	XX	1,080,000	XX	1,270,000
Arizona:							
Copper[5]		767	1,280,000	741	1,390,000	723	2,130,000
Gemstones		NA	1,670	NA	1,440	NA	1,450
Sand and gravel:							
Construction		53,800	294,000	62,600	340,000	79,600	430,000
Industrial		W	W	W	W	W	792
Stone, crushed		8,450	51,500 r	9,950	49,100	11,100	57,200
Combined values of cement, clays (bentonite, common), gold, gypsum (crude), lime, mica (2002), molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone (dimension sandstone), zeolites (2004), and values indicated by symbol W		XX	318,000	XX	394,000	XX	709,000
Total		XX	1,950,000 r	XX	2,180,000	XX	3,330,000
Arkansas:							
Clays, common		922	2,280	897	1,410	1,150	1,510
Gemstones		NA	637	NA	477	NA	590
Sand and gravel, construction		8,810	45,600	9,720	52,100	9,370	53,500
Silica stone[3]	metric tons	386	3,740	513	3,630	655	3,660
Stone, crushed		30,600 r	158,000 r	29,700 r	145,000 r	32,900	161,000
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (dimension limestone and sandstone), tripoli		XX	247,000	XX	251,658	XX	298,000
Total		XX	457,000 r	XX	454,000 r	XX	518,000
California:							
Asbestos	metric tons	2,770	1,380	--	--	--	--
Boron minerals		1,050	513,000	1,150	591,000	1,210	626,000
Cement, portland		11,200	853,000 e	11,600	887,000 e	11,900	1,000,000 e

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
California—Continued:							
Clays:							
Bentonite		26	2,830	23	2,560	24	2,640
Common		1,030	21,400	1,240	19,100	1,230	20,700
Fuller's earth		W	W	W	W	197	W
Gemstones		NA	1,040	NA	1,080	NA	1,070
Gold[3]	kilograms	9,180	91,900	4,270	50,100	3,260	43,000
Sand and gravel:							
Construction		151,000	1,110,000	152,000	1,150,000	166,000	1,280,000
Industrial		1,800	48,000	1,790	50,100	1,990	55,700
Silver[3]	kilograms	3,400	506	957	151	801	172
Stone:							
Crushed		67,400	423,000	55,500	371,000 r	55,400	365,000
Dimension		41	9,870	40	9,920	42	10,200
Combined values of cement (masonry), clays [fire (2002), kaolin], diatomite, feldspar, gypsum (crude), iron ore (usable), lime, magnesium compounds, perlite (crude), pumice and pumicite, pyrophyllite [crude (2003)], rare-earth metal concentrates (2002), salt, soda ash, talc (crude), zeolites (2004), and values indicated by symbol W		XX	340,000 r	XX	308,000	XX	349,000
Total		XX	3,410,000 r	XX	3,440,000 r	XX	3,760,000
Colorado:							
Clays:							
Bentonite		W	W	W	W	5	W
Common		214	1,260	259	1,580	249	1,510
Gemstones		NA	269	NA	281	NA	360
Lime		20	1,250	26	2,330	26	2,570
Sand and gravel:							
Construction		40,700	222,000	37,500	213,000	40,900	235,000
Industrial		61	W	70	W	W	3,300
Stone:							
Crushed		15,000	96,000	10,400	64,000 r	11,000	67,300
Dimension		18	2,400	5	1,610	16	1,980
Combined values of cement, gold, gypsum (crude), helium (Grade-A), molybdenum concentrates, silver, soda ash, and values indicated by symbol W		XX	312,000 r	XX	391,000	XX	699,000
Total		XX	634,000 r	XX	673,000	XX	1,010,000
Connecticut:							
Clays, common		55	183	52	143	87	(6)
Gemstones		NA	6	NA	6	NA	6
Sand and gravel, construction		8,140	48,800	8,150	51,200	8,330	55,600
Stone:							
Crushed		10,200	76,500 r	10,400	81,800	10,000	75,700
Dimension		W	(6)	W	(6)	W	(6)
Total		XX	125,000 r	XX	133,000	XX	131,000
Delaware:							
Gemstones		NA	1	NA	1	NA	1
Magnesium compounds	metric tons	W	(6)	W	(6)	W	(6)
Sand and gravel, construction		2,190	17,300	2,550	17,900	2,980	21,900
Total		XX	17,300	XX	17,900	XX	21,900
Florida:							
Cement:							
Masonry		591	64,000 e	674	82,900 e	763	97,600 e
Portland		3,950	297,000 e	4,190	323,000 e	5,230	432,000 e

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Florida—Continued:						
Clays:						
Common	W	W	94 e	1,280 e	W	W
Fuller's earth	W	W	W	W	234	W
Kaolin	32	3,370	31	3,250	31	3,280
Gemstones	NA	1	NA	1	NA	1
Lime	--	--	--	--	24	2,090
Peat	559	11,500	373	7,440	478	9,710
Sand and gravel:						
Construction	26,400	114,000	30,900	141,000	29,300	146,000
Industrial	645	8,640	624	7,270	679	8,520
Stone, crushed	97,700	573,000	97,100 r	587,000 r	105,000	675,000
Combined values of magnesium compounds, phosphate rock, staurolite, titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	963,000	XX	918,000	XX	945,000
Total	XX	2,030,000	XX	2,070,000	XX	2,320,000
Georgia:						
Clays:						
Common	1,310	5,500	1,280	4,430	1,550	8,710
Fuller's earth	979	93,800	1,570	145,000	1,400	142,000
Kaolin	6,830	893,000	6,610	884,000	6,780	898,000
Gemstones	NA	8	NA	8	NA	9
Sand and gravel:						
Construction	6,600	27,200	7,690	31,800	9,270	39,400
Industrial	606	12,200	590	11,900	665	13,400
Stone:						
Crushed	70,500 r	461,000 r	75,200	519,000	79,500	544,000
Dimension	111	18,200	114	22,700	146	22,100
Combined values of barite, cement, clays [bentonite (2002)], feldspar, iron oxide pigments (crude), lime, mica (crude)	XX	129,000 r	XX	117,000	XX	134,000
Total	XX	1,640,000 r	XX	1,740,000	XX	1,800,000
Hawaii:						
Cement, masonry	W	(3)	W	(3)	--	--
Gemstones	NA	109	NA	119	NA	262
Sand and gravel, construction	610	7,010	808 r	9,560	1,260	12,100
Stone, crushed	6,380	65,100	5,620 r	65,400 r	5,190	58,900
Total	XX	72,300	XX	75,100 r	XX	71,200
Idaho:						
Gemstones	NA	460	NA	477	NA	836
Sand and gravel, construction	15,700	57,700	16,500	59,300	19,600	74,300
Stone, crushed	3,420	15,800	3,160	15,700	3,320	17,400
Combined values of cement (portland), copper, feldspar, garnet (industrial), gold (2002-03), lead, lime, molybdenum concentrates, perlite (crude), phosphate rock, pumice and pumicite, sand and gravel (industrial), silver, stone [dimension granite, quartz, sandstone (2002), dimension quartzite and sandstone (2003-04), zeolites (2004), zinc	XX	197,000	XX	193,000	XX	354,000
Total	XX	271,000	XX	269,000	XX	446,000
Illinois:						
Cement, portland	2,770	204,000 e	2,930	210,000 e	3,010	233,000 e
Clays:						
Common	181	856	179	1,010	247	1,390
Fuller's earth	W	W	W	W	218	W
Gemstones	NA	28	NA	28	NA	70

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Illinois—Continued:							
Sand and gravel:							
Construction		32,000	146,000	34,600	161,000	38,700	203,000
Industrial		4,510	72,800	4,440	72,600	4,950	86,200
Stone, crushed[4]		75,200	431,000	76,000	453,000	76,500	465,000
Combined values of lime, peat, stone (crushed sandstone), tripoli, and values indicated by symbol W		XX	62,100	XX	74,000	XX	65,400
Total		XX	917,000	XX	971,000	XX	1,050,000
Indiana:							
Cement, portland		2,940	197,000 e	2,930	203,000 e	3,080	218,000 e
Clays, common		429 r	1,240 r	385	767	729	1,890
Gemstones		NA	4	NA	4	NA	4
Sand and gravel, construction		27,600	122,000	32,900	129,000	28,300	116,000
Stone:							
Crushed		55,500	268,000	50,500	237,000 r	56,800	253,000
Dimension		237	39,500	242	42,100	251	45,500
Combined values of cement (masonry), clays (ball), gypsum (crude), lime, peat, sand and gravel (industrial)		XX	104,000	XX	104,000	XX	130,000
Total		XX	733,000 r	XX	716,000 r	XX	764,000
Iowa:							
Clays, common		256	763	256	763	325	1,150
Gemstones		NA	2	NA	2	NA	2
Sand and gravel, construction		14,600	62,300	13,400	61,000	17,100	74,300
Stone, crushed		35,900	194,000	35,600	207,000	36,800	215,000
Combined values of cement, gypsum (crude), lime, peat, sand and gravel (industrial)		XX	231,000	XX	235,000	XX	239,000
Total		XX	488,000	XX	504,000	XX	529,000
Kansas:							
Cement, portland		2,350	181,000 e	2,270	173,000 e	2,690	212,000 e
Clays, common		642	4,280	632	10,000	621	7,460
Gemstones		NA	1	NA	1	NA	1
Helium, Grade-A	million cubic meters	78	181,000	77	179,000	82	189,000
Salt		2,630	119,000	2,770	123,000	2,890	127,000
Sand and gravel, construction		9,560	28,700	10,700	34,900	9,930	32,800
Stone:							
Crushed		21,300 r	106,000 r	20,700 r	111,000	19,800	109,000
Dimension		15	1,900	15	1,640	14	1,730
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial)		XX	64,800	XX	65,100	XX	75,300
Total		XX	687,000 r	XX	696,000	XX	754,000
Kentucky:							
Clays, common		925	4,740	983	3,770	978	4,510
Gemstones		NA	64	NA	22	NA	22
Sand and gravel, construction		9,530	37,900	10,000	46,500	10,300	49,700
Stone, crushed		50,600	302,000	52,400	326,000	55,600	347,000
Combined values of cement, clays (ball), lime		XX	197,000	XX	220,000	XX	246,000
Total		XX	542,000	XX	597,000	XX	648,000
Louisiana:							
Clays, common		667	1,680	670	1,690	399	1,000
Gemstones		NA	6	NA	6	NA	6
Salt		12,000	129,000	12,600	152,000	14,300	186,000
Sand and gravel:							
Construction		17,900	96,800	21,200	105,000	19,400	103,000
Industrial		541	12,000	499	17,200	476	14,800

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Louisiana—Continued:						
Combined values of gypsum (crude), lime, stone (crushed limestone, sandstone, miscellaneous)	XX	72,400	XX	91,000	XX	51,200
Total	XX	312,000	XX	367,000	XX	356,000
Maine:						
Clays, common	49 e	125 e	49 e	125 e	49	W
Gemstones	NA	257	NA	262	NA	268
Sand and gravel, construction	9,680	40,400	10,400	47,600	10,800	49,100
Stone, crushed	4,010	23,400	3,530	22,500	4,370	29,500
Combined values of cement, peat, stone (dimension granite), and values indicated by symbol W	XX	35,400	XX	36,700	XX	39,300
Total	XX	99,700	XX	107,000	XX	118,000
Maryland:						
Cement, portland	1,880	140,000 e	2,200	147,000 e	2,520	175,000 e
Clays, common	268	550	269	550	262	571
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	12,200	83,500	11,800	79,900	12,700	75,500
Stone:						
Crushed[4]	22,300	141,000	26,200	165,000	29,900	185,000
Dimension	21	2,120	24	2,700	27	9,580
Combined values of cement (masonry), sand and gravel (industrial), stone (crushed marble, shell, traprock)	XX	33,500	XX	31,700	XX	35,400
Total	XX	400,000	XX	427,000	XX	481,000
Massachusetts:						
Clays, common	36	321	36	321	36	(6)
Gemstones	NA	1	NA	1	NA	1
Lime	W	(6)	W	(6)	W	(6)
Sand and gravel, construction	12,200	75,300	12,900	80,800	14,400	90,000
Stone:						
Crushed	13,800	111,000 r	13,000	111,000	13,600	109,000
Dimension	81	11,300	81	11,300	82	11,600
Total	XX	198,000	XX	204,000	XX	210,000
Michigan:						
Cement, masonry	292	30,000 e	237	24,300 e	231	27,100 e
Clays, common	499	884	588	3,050	605	3,070
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	1,020	10,800	500	6,130	452	5,660
Peat	131	3,790	125	3,460	122	3,360
Sand and gravel:						
Construction	77,300	267,000	71,000	253,000	69,500	254,000
Industrial	2,210	31,000	2,130	31,400	1,690	25,200
Stone, crushed[4]	41,100	171,000 r	33,600	123,000 r	35,800	140,000
Combined values of bromine, cement (portland), iron ore (usable), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone (crushed marl and miscellaneous, dimension dolomite and sandstone)	XX	962,000	XX	1,140,000 r	XX	1,210,000
Total	XX	1,480,000 r	XX	1,580,000 r	XX	1,670,000
Minnesota:						
Clays, common	14	15	20	22	20	22
Gemstones	NA	6	NA	6	NA	6
Iron ore, usable	39,600	1,050,000	34,000 r	1,030,000 r	41,400	1,560,000
Lime	W	(6)	W	(6)	W	(6)
Peat	64	5,320	60	5,070	63	5,210

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Minnesota—Continued:							
Sand and gravel:							
Construction		43,700	175,000	48,900	212,000	54,900	235,000
Industrial		W	(6)	W	(6)	W	(6)
Stone:							
Crushed		9,960	57,600	9,880	61,800	10,900	68,300
Dimension		22	12,400	16	11,900	22	12,400
Total		XX	1,300,000	XX	1,320,000 r	XX	1,890,000
Mississippi:							
Clays:							
Common		496	2,210	524	2,050	610	2,700
Fuller's earth		411	29,900	534	42,700	381	35,200
Gemstones		NA	1	NA	1	NA	1
Sand and gravel, construction		13,600	73,200	14,600	82,600	14,100	80,700
Stone, crushed		2,620	27,900	2,850	33,900	2,760	34,200
Combined values of cement (portland), clays (ball, bentonite), sand and gravel (industrial)		XX	44,600	XX	31,400	XX	41,500
Total		XX	178,000	XX	193,000	XX	194,000
Missouri:							
Cement, portland		4,820	333,000 e	5,180	352,000 e	5,260	388,000 e
Clays:							
Common		1,050	3,930	970	3,660	911	3,290
Fire		340	7,360	307	7,230	W	W
Sand and gravel:							
Construction		10,000	42,300	10,600	49,400	12,200	60,000
Industrial		W	W	586	12,800	589	14,200
Stone, crushed		73,200 r	376,000 r	71,500	426,000	69,100	415,000
Combined values of cement (masonry), clays (fuller's earth), copper, gemstones (natural), lead, lime, silver, stone (dimension granite), zinc, and values indicated by symbol W		XX	494,000	XX	488,000	XX	593,000
Total		XX	1,260,000	XX	1,340,000	XX	1,470,000
Montana:							
Clays, bentonite		181	14,900	181	14,900	102	8,400
Gemstones		NA	424	NA	707	NA	653
Palladium[4]	kilograms	14,800	162,000	14,000	91,400	13,700	102,000
Platinum[4]	do.	4,390	76,500	4,170	93,100	4,040	110,000
Sand and gravel, construction		16,700	76,000	15,200	74,200	14,400	80,000
Stone:							
Crushed		2,370	10,000	3,060	12,200	4,090	17,500
Dimension		12	2,620	14	2,590	14	2,550
Combined values of cement [masonry (2002-03), portland], clays (common), copper (2003-04), garnet [industrial (2002)], gold, lead, lime, molybdenum concentrates (2003-04), peat, silver, talc (crude), zinc		XX	129,000	XX	205,000	XX	303,000
Total		XX	471,000	XX	494,000	XX	624,000
Nebraska:							
Cement:							
Masonry		W	(6)	W	(6)	W	(6)
Portland		W	(6)	W	(6)	W	(6)
Clays, common[c]		133	338	133	338	133	338
Gemstones		NA	4	NA	4	NA	4
Lime		8	692	8	692	11	514

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Nebraska—Continued:							
Sand and gravel:							
Construction		12,900	44,200	13,300	45,000	15,100	53,200
Industrial		W	(6)	W	(6)	W	(6)
Stone, crushed		7,220	53,200	6,960	49,200	6,900	51,900
Total		XX	98,400	XX	95,300	XX	106,000
Nevada:							
Clays:							
Bentonite		6	W	6	817	7	W
Fuller's earth		28	3,870	28	3,870	W	W
Gold[4]	kilograms	240,000	2,410,000	227,000	2,660,000	216,000	2,850,000
Sand and gravel:							
Construction		35,400	159,000	37,100	174,000	43,100	197,000
Industrial		615	11,000	W	W	W	W
Silver[4]	kilograms	424,000	63,000	322,000	50,900	302,000	65,000
Stone, crushed		8,010	41,900	7,830	48,500	9,760	72,800
Combined values of barite, brucite, cement (portland), clays (kaolin), copper (2004), diatomite, gemstones, gypsum (crude), lead (2002), lime, lithium carbonate, magnesite, perlite (crude), salt, zeolites (2004), and values indicated by symbol W		XX	228,000	XX	252,000	XX	286,000
Total		XX	2,910,000	XX	3,190,000	XX	3,470,000
New Hampshire:							
Gemstones		NA	6	NA	6	NA	6
Sand and gravel, construction		8,640	41,600	8,470	41,200	8,940	46,600
Stone:							
Crushed		4,810 r	24,500 r	4,110	21,400	4,750	24,000
Dimension, granite		W	(6)	W	(6)	W	(6)
Total		XX	66,100 r	XX	62,500	XX	70,600
New Jersey:							
Clays, common		W	W	W	W	W	122
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		16,000	96,300	18,200	105,000	20,100	120,000
Industrial		1,420	32,700	1,570	32,700	2,020	35,800
Stone, crushed		20,500	118,000 r	24,800	179,000 r	25,500	186,000
Combined values of greensand marl, peat, and values indicated by symbol W		XX	3,910	XX	4,190	XX	(6)
Total		XX	251,000 r	XX	321,000 r	XX	341,000
New Mexico:							
Clays, common		33	175	36	209	34	177
Copper[3]		112	187,000	88	165,000	122	362,000
Gemstones		NA	19	NA	20	NA	20
Sand and gravel, construction		12,800	62,600	13,300	65,300	13,600	89,500
Silver	kilograms	--	--	--	--	3,570	767
Stone:							
Crushed		3,680	23,300	3,730 r	26,000 r	3,430	24,400
Dimension		20	1,370	57	2,590	57	2,430
Combined values of cement, gold (2004), gypsum (crude), helium (Grade-A), iron ore [usable (2002)], lime, mica [crude (2003-04)], molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, zeolites (2004)		XX	282,000 r	XX	310,000	XX	387,000
Total		XX	557,000 r	XX	569,000	XX	866,000
New York:							
Clays, common		641	7,990	644	8,050	756	10,900

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
New York—Continued:						
Gemstones	NA	65	NA	65	NA	74
Salt	4,610	185,000	5,230	225,000	6,430	301,000
Sand and gravel, construction	29,800	158,000	30,200	172,000	33,100	189,000
Stone:						
Crushed	56,500	391,000	53,700	352,000	52,700	349,000
Dimension	46	5,990	65	6,110	44	4,560
Combined values of cement, garnet (industrial), peat, sand and gravel (industrial), talc (crude), wollastonite	XX	243,000	XX	235,000	XX	256,000
Total	XX	991,000	XX	998,000	XX	1,110,000
North Carolina:						
Clays:						
Common	2,420	11,900	2,190	10,900	2,260	12,900
Kaolin	W	W	W	4,500	34	764
Feldspar	330 r	17,100	362	18,900	351	20,500
Gemstones	NA	280	NA	279	NA	280
Mica, crude	40 r	3,100	39	9,580	40	9,600
Sand and gravel:						
Construction	10,000	50,700	10,500	55,600	11,500	59,700
Industrial	1,320	25,600	1,530	26,700	1,630	29,000
Stone:						
Crushed	62,900	451,000	67,100	505,000 r	72,300	548,000
Dimension	41	17,900	47	18,700	43	18,200
Combined values of olivine, phosphate rock, pyrophyllite (crude), and value indicated by symbol W	XX	111,000	XX	84,500	XX	105,000
Total	XX	689,000	XX	734,000 r	XX	805,000
North Dakota:						
Clays, common	57	W	W	W	W	186
Gemstones	NA	4	NA	4	NA	4
Sand and gravel, construction	10,700	27,900	13,500	35,900	11,700	32,800
Combined values of lime, sand and gravel (industrial), stone [crushed granite, limestone, volcanic cinder, and miscellaneous (2002), crushed limestone, volcanic cinder, miscellaneous (2003), crushed granite, scoria, traprock, volcanic cinder, miscellaneous (2004)], and values indicated by symbol W	XX	8,540	XX	10,600	XX	11,500
Total	XX	36,500	XX	46,500	XX	44,500
Ohio:						
Cement:						
Portland	1,020	78,000 e	1,030	82,200 e	98	13,000 e
Masonry	W	W	W	W	1,020	85,700 e
Clays:						
Common	1,310	7,820	1,440	7,430	1,360	7,480
Fire	W	W	W	W	42	W
Gemstones	NA	4	NA	4	NA	4
Lime	1,630	98,100	1,880	114,000	1,880	127,000
Sand and gravel:						
Construction	48,700	250,000	47,300	242,000	50,800	263,000
Industrial	1,000	28,900	1,120	32,100	1,180	34,200
Stone:						
Crushed	72,000 r	326,000 r	70,500	339,000	76,400	385,000
Dimension	30	4,990	30	5,090	38	5,100
Combined values of gypsum [crude (2002)], peat, salt, and values indicated by symbol W	XX	176,000	XX	188,000	XX	197,000
Total	XX	970,000 r	XX	1,010,000	XX	1,120,000

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Oklahoma:							
Clays, common		1,030	2,250	1,160	2,390	1,150	2,410
Gemstones		NA	197	NA	197	NA	4
Gypsum, crude		2,520	18,500	2,250	14,100	3,250	20,800
Iodine, crude	metric tons	1,420	21,600	1,090	15,900	1,130	15,900
Sand and gravel:							
Construction		10,200	41,300	11,000	48,500	12,000	53,700
Industrial		1,320	28,400	1,360	29,700	1,390	31,600
Stone:							
Crushed		45,000	196,000	40,100 r	193,000	40,200	195,000
Dimension		17	2,100	17	2,100	17	2,100
Tripoli	metric tons	12,700	2,290	10,600	1,960	32,100	2,120
Combined values of cement, feldspar, helium [crude (2002), Grade-A], lime, salt		XX	160,000	XX	163,000	XX	183,000
Total		XX	473,000	XX	470,000	XX	507,000
Oregon:							
Clays:							
Bentonite		W	W	W	W	10	W
Common		237	662	W	W	W	W
Gemstones		NA	1,340	NA	1,200	NA	1,210
Sand and gravel, construction		19,500	116,000	18,500	110,000	21,000	125,000
Stone, crushed		19,800	101,000	21,800	117,000	22,800	126,000
Zeolites	metric tons	W	NA	W	NA	--	--
Combined value of cement (portland), diatomite, emery (2002), lime, perlite (crude), pumice and pumicite, talc (crude), and values indicated by symbol W		XX	101,000	XX	92,700	XX	114,000
Total		XX	320,000	XX	320,000	XX	367,000
Pennsylvania:							
Cement:							
Masonry		341	38,000 e	342	35,900 e	W	W
Portland		6,130	456,000 e	5,720	421,000 e	6,230	473,000 e
Clays, common		779	2,560	750	2,240	822	3,270
Gemstones		NA	1	NA	1	NA	1
Lime		1,230	87,600	1,190	90,100	1,220	100,000
Peat		3	132	8	219	11	307
Sand and gravel, construction		18,100	115,000	18,400	115,000	20,000	127,000
Stone:							
Crushed		102,000	578,000 r	104,000 r	597,000	112,000	635,000
Dimension		37	11,900	32	10,400	33	10,100
Combined values of sand and gravel (industrial), tripoli, and value indicated by symbol W		XX	(6)	XX	(6)	XX	55,800
Total		XX	1,290,000	XX	1,270,000	XX	1,400,000
Rhode Island:							
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		1,760	14,100	2,450	21,000	2,490	22,000
Industrial		157	(6)	W	(6)	W	(6)
Stone, crushed		1,780	11,400	1,340	10,700	1,600	12,400
Total		XX	25,500	XX	31,700	XX	34,400
South Carolina:							
Cement:							
Masonry		426	41,000 e	425	43,700 e	453	49,900 e
Portland		2,510	176,000 e	3,150	194,000 e	3,110	196,000 e

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
South Carolina—Continued:						
Clays:						
Common	1,020	3,360	1,060	2,660	1,050	3,350
Fire	53	739	W	W	1	64
Kaolin	374	21,400	355	21,700	296	19,600
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	10,300	35,500	10,100	34,700	9,960	35,100
Industrial	831	16,400	655	16,700	719	17,600
Stone:						
Crushed	25,700	165,000	27,300	184,000	31,300	210,000
Dimension	9	850	9	850	9	850
Combined values of mica (crude), vermiculite (crude), and value indicated by symbol W	XX	(6)	XX	10,100	XX	(6)
Total	XX	460,000	XX	508,000	XX	532,000
South Dakota:						
Clays, common	208	W	213	W	188	W
Sand and gravel, construction	11,900	47,500	11,800	44,800	14,000	51,700
Stone, crushed	6,780	33,600	6,880	24,700	5,370	27,000
Combined values of cement (portland), feldspar, gemstones, gold, gypsum (crude), iron ore [usable (2002)], lime, mica (crude), silver (2002), stone (dimension granite), and values indicated by symbol W	XX	135,000	XX	130,000	XX	131,000
Total	XX	216,000	XX	199,000	XX	210,000
Tennessee:						
Clays:						
Ball	660	28,100	766	33,400	762	34,300
Common	262	1,540	304	585	365	3,140
Fuller's earth	W	W	92 e	5,000 e	W	W
Sand and gravel:						
Construction	9,220	51,900	7,550	44,100	7,830	47,500
Industrial	1,070	25,700	961	21,800	975	26,100
Stone, crushed	54,900	330,000	55,100	354,000	57,900	382,000
Combined values of cement, clays [kaolin (2002, 2004)], gemstones, lime, salt, stone (dimension marble), zinc, and values indicated by symbol W	XX	212,000	XX	164,000	XX	160,000
Total	XX	648,000	XX	623,000	XX	653,000
Texas:						
Cement:						
Masonry	294	36,000 e	307	36,100 e	319	38,000 e
Portland	10,500	740,000 e	11,100	747,000 e	11,200	800,000 e
Clays:						
Common	2,160	21,200	2,110	8,890	2,160	8,890
Fuller's earth	W	W	27	2,400	W	W
Kaolin	39	8,420	33	7,150	W	W
Gemstones	NA	12	NA	201	NA	201
Gypsum, crude	2,060	13,400	1,810	12,300	2,450	18,800
Lime	1,530	98,400	1,630	110,000	1,630	115,000
Salt	9,100	103,000	9,640	116,000	9,870	118,000
Sand and gravel:						
Construction	82,600	413,000	86,200	425,000	81,700	436,000
Industrial	1,670	62,200	1,930	81,700	2,790	109,000
Stone:						
Crushed	109,000 r	528,000 r	126,000	595,000	122,000	582,000
Dimension	65	12,200	87	16,400	64	15,200

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Texas—Continued:							
Talc, crude		W	W	246	W	258	W
Combined values of brucite, clays (ball, bentonite), helium, zeolites (2004), and values indicated by symbol W		XX	40,900	XX	33,300	XX	46,300
Total		XX	2,080,000 r	XX	2,190,000	XX	2,290,000
Utah:							
Beryllium concentrates	metric tons	1,970	NA	2,100	NA	2,210	NA
Clays:							
Bentonite		W	W	W	W	73	W
Common		349	5,010	300	3,270	443	5,600
Gemstones		NA	230	NA	233	NA	235
Salt		2,090	113,000	2,200	119,000	2,250	107,000
Sand and gravel, construction		27,600	104,000	27,400	113,000	29,800	125,000
Stone, crushed		7,640	38,100	7,820	40,100	8,020	44,900
Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone (dimension sandstone), and values indicated by symbol W		XX	980,000	XX	1,080,000	XX	1,660,000
Total		XX	1,240,000	XX	1,360,000	XX	1,940,000
Vermont:							
Gemstones		NA	1	NA	1	NA	1
Sand and gravel, construction		4,990	22,200	4,520	21,100	4,970	24,000
Stone:							
Crushed		4,360	21,300	4,290	23,900	5,110	30,800
Dimension		101	27,000	102	26,700	100	30,600
Talc, crude	metric tons	W	(6)	W	(6)	W	(6)
Total		XX	70,600	XX	71,800	XX	85,400
Virginia:							
Clays:							
Bentonite		--	--	--	--	5	W
Common		827	3,320	958	2,530	994	4,640
Kyanite[e]		90	13,400	90	13,400	90	13,400
Sand and gravel, construction		10,500	60,000	11,300	65,500	12,800	75,800
Stone:							
Crushed		58,900	395,000	66,500	481,000	72,500	546,000
Dimension		6	651	6	651	5	594
Combined values of cement, clays (fuller's earth), feldspar, gemstones, iron oxide pigments (crude), lime, sand and gravel (industrial), talc (crude), titanium concentrates (ilmenite), vermiculite (crude), zirconium concentrates, and value indicated by symbol W		XX	218,000	XX	223,000	XX	253,000
Total		XX	690,000	XX	786,000	XX	894,000
Washington:							
Clays, common		89	169	83	204	W	W
Gemstones		NA	29	NA	44	NA	44
Gold[4]	kilograms	980	9,810	--	--	W	W
Sand and gravel, construction		43,200	223,000	40,700	216,000	41,500	227,000
Silver[4]	kilograms	729	108	--	--	W	W
Stone, crushed		13,700	79,900	12,000	73,700	12,300	76,100
Combined values of cement (portland), diatomite, lead (2004), lime, olivine, peat, sand and gravel (industrial), stone [dimension miscellaneous (2004)], zinc (2004), and values indicated by symbol W		XX	124,000	XX	107,000	XX	205,000
Total		XX	437,000	XX	396,000	XX	507,000

See footnotes at end of table.

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TABLE 5—Continued

NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
West Virginia:						
Clays, common	151	407	142	376	161	441
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	1,700	8,450	971	4,750	524	2,500
Industrial	W	W	W	W	343	17,300
Stone, crushed	14,400	63,400	14,100	69,100 r	14,700	73,100
Combined values of cement, lime, peat, salt, stone (dimension sandstone), and values indicated by symbol W	XX	94,900	XX	90,100	XX	73,500
Total	XX	167,000	XX	164,000	XX	167,000
Wisconsin:						
Cement, portland	W	(6)	W	(6)	W	(6)
Gemstones	NA	6	NA	6	NA	6
Lime	603	35,600	757	46,000	850	53,900
Peat	W	(6)	W	(6)	W	(6)
Sand and gravel:						
Construction	39,000	154,000	38,500	150,000	43,400	178,000
Industrial	1,740	32,700	1,930	40,200	2,140	47,000
Stone:						
Crushed	36,200	151,000	35,900	160,000	38,600	167,000
Dimension	100	19,300	101	19,700	232	23,800
Total	XX	392,000	XX	417,000	XX	470,000
Wyoming:						
Clays:						
Bentonite	3,340	145,000	3,420	148,000	3,510	151,000
Common	33	446	25	55	49	107
Gemstones	NA	12	NA	13	NA	13
Sand and gravel, construction	7,710	32,100	8,290	36,400	10,200	40,100
Stone, crushed	4,450 r	20,500 r	5,020	22,600	7,150	34,500
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, zeolites (2004)	XX	806,000	XX	792,000	XX	819,000
Total	XX	1,000,000 r	XX	999,000	XX	1,040,000
Undistributed:						
Connecticut, Delaware, Hawaii (2002-03), Massachusetts, Minnesota, Nebraska, New Hampshire, Pennsylvania (2002-03), Rhode Island, South Carolina (2002, 2004), Vermont, Winsonsin, undistributed	XX	202,000	XX	220,000	XX	197,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Combined values" data for each State. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Excludes certain stones; kind and value included in "Combined value."

[5]Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

[6]Withheld to avoid disclosing company proprietary data; values included in "Undistributed."

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TABLE 6

NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement, portland	1,530	W	1,490	W	1,580	W
Clays, common	114 r	585	114	585	114	585
Lime	W	W	W	W	11	2,250
Salt	45	1,500	45	1,500	45	1,500
Stone, crushed	7,940	40,600	9,130	60,000	8,660	57,600
Combined values of sand and gravel (industrial), stone (dimension marble), and values indicated by symbol W	XX	144,000	XX	119,000	XX	125,000
Total	XX	187,000	XX	181,000	XX	187,000
Administered Islands:						
American Samoa, stone (crushed traprock)	(3)	(3)	(3)	(3)	(3)	(3)
Guam, stone, crushed	846	8,370	728	7,670	1,410	13,000
Virgin Islands, stone (crushed limestone and traprock)	(3)	(3)	(3)	(3)	(3)	(3)
Total	XX	8,370	XX	7,670	XX	13,000

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Combined values" data.

XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Withheld to avoid disclosing company proprietary data.

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TABLE 7

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003		2004	
		Quantity	Value	Quantity	Value
Metals:					
Aluminum:					
Crude and semicrude	metric tons	1,540,000	3,220,000	1,820,000	4,130,000
Manufactures	do.	115,000	365,000	129,000	437,000
Antimony:					
Metal, alloys, waste and scrap	do.	771	3,010	566	2,280
Oxide, antimony content	do.	2,910	11,600	3,240	13,200
Arsenic metal, arsenic content	do.	173	15,200	220	20,700
Bauxite and alumina:					
Alumina, calcined equivalent		1,090	368,000	1,230	439,000
Bauxite:					
Calcined, refractory and other grade		22	3,420	21	2,950
Crude and dried		55	8,270	42	7,910
Speciality aluminum compounds, sulfate, chloride, fluoride-based	metric tons	36,200	27,200	28,100	21,300
Beryllium, unwrought, and waste and scrap, other including articles not elsewhere specified	kilograms	269,000	18,800	217,000	19,600
Bismuth, metal, alloys, waste and scrap, bismuth content	do.	108,000	3,130	109,000	2,500
Cadmium:					
Metal, includes cadmium in alloys and scrap	do.	558,000	1,060	132,000	861
Sulfide, gross weight	do.	184,000	97	160,000	76
Chromium:					
Ores and concentrate	do.	103,000	7,410	43,100	10,400
Metals and alloys:					
Metal, unwrought powders, waste and scrap, other	do.	941	11,900	931	17,600
Ferroalloys, high-carbon, low-carbon, ferrochromium-silicon	do.	4,890	5,240	9,140	12,000
Chemicals:					
Oxides, trioxides and other	do.	10,100	20,600	12,900	22,200
Sulfates	do.	5	62	39	417
Salts of oxometallic or peroxometallic acids, zinc and lead chromate, sodium dichromate, potassium dichromate, other	do.	12,200	8,590	21,800	14,400
Pigments and preparations	do.	867	4,610	671	3,780
Cobalt:					
Acetates and chlorides	do.	616	3,370	666	5,490
Oxides and hydroxides	do.	375	6,110	324	13,800
Metal:					
Unwrought, powders, waste and scrap, mattes, other intermediate products of metallurgy	do.	2,290	48,600	2,110	79,400
Wrought and cobalt articles	do.	1,010	31,300	1,150	48,400
Columbium (niobium) and tantalum:					
Columbium:					
Ores and concentrates	do.	170	1,270	16	108
Ferrocolumbium	do.	143	1,430	294	2,920
Tantalum:					
Ores and concentrates, includes synthetic	do.	365	4,360	723	19,300
Unwrought, waste and scrap, powders, alloys, metal	do.	348	163,000	598	173,000
Wrought	do.	119	62,200	162	83,400
Copper:					
Unmanufactured, does not include unalloyed scrap, copper content	do.	145,000	265,000	211,000	429,000
Semimanufactures	do.	189,000	537,000	236,000	863,000
Scrap, alloyed and unalloyed	do.	689,000	664,000	714,000	882,000
Ferroalloys not listed elsewhere:					
Ferrophosphorous	do.	787	511	388	335
Other	do.	1,350	2,470	1,620	2,670

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Metals—Continued:					
Gold:					
Ores and concentrates	kilograms	826	7,870	1,150	10,200
Dore and precipitates	do.	131,000	1,550,000	142,000	1,860,000
Bullion, refined	do.	220,000	2,500,000	114,000	1,500,000
Waste and scrap	do.	159,000	559,000	726,000	815,000
Metal powder	do.	874	9,590	647	8,670
Compounds	do.	565,000	10,600	1,170,000	29,000
Indium[e]	metric tons	10	1,740	NA	NA
Iron and steel:					
Steel mill products		7,460	5,490,000	7,200	9,280,000
Fabricated steel products		963	3,170,000	1,410	4,340,000
Cast iron and steel products		206	374,000	234	661,000
Iron and steel scrap:					
Ferrous, includes tinplate and ternplate, excludes used rails for rerolling and other uses and ships, boats, and other vessels for scrapping		10,800 r	1,940,000 r	11,800	2,910,000
Pig iron, all grades		86 r	8,850 r	48	6,690
Direct-reduced iron, steelmaking grade		5 r	525 r	13	1,360
Ships, boats, and other vessels for scrapping		48	2,580	16	2,680
Used rails for rerolling and other uses, includes mixed (used plus new) rails		49	16,100	42	18,100
Iron ore		6,770	248,000	8,400	334,000
Lead:					
Ore and concentrates, Pb content	metric tons	253,000	97,700	292,000	157,000
Base bullion, Pb content	do.	593	885	129	841
Unwrought and alloys, Pb content	do.	92,100	58,500	58,600	50,100
Wrought and alloys, Pb content	do.	30,500	34,500	23,800	42,300
Scrap, gross weight	do.	92,800	23,300	56,300	14,800
Magnesium:					
Waste and scrap, Mg content	do.	5,030	11,800	4,790	11,300
Metal, Mg content	do.	8,770	15,700	1,760	3,830
Alloys, gross weight	do.	2,330	8,330	1,750	7,780
Powder, sheets, tubing, ribbons, wire, other forms, gross weight	do.	4,260	28,300	3,530	25,800
Manganese, gross weight:					
Ores and concentrates with 20% or more manganese	do.	18,200	3,580	123,000	12,400
Ferromanganese, all grades	do.	10,600	8,840	9,120	10,600
Silicomanganese	do.	606	554	502	632
Metal, including alloys and waste and scrap	do.	2,340	4,790	2,790	6,090
Dioxide	do.	4,470	4,590	4,000	3,680
Mercury:					
Metal	do.	287	1,690	278	2,310
Amalgams of precious metals whether or not chemically defined	do.	1,660	119,000	603	155,000
Molybdenum:					
Ore and concentrates, including roasted and other, Mo content	do.	29,500	195,000	46,200	358,000
Chemicals:					
Oxides and hydroxides, gross weight	do.	2,580	20,000	5,280	80,300
Molybdates, all, gross weight	do.	2,270	16,700	2,680	28,500
Ferromolybdenum, Mo content	do.	617	8,660	925	21,200
Other, includes powders, unwrought, bars and rods, waste and scrap, wire, other, gross weight	do.	1,060	28,400	1,520	66,000
Nickel, Ni content:					
Primary, unwrought and chemicals	do.	6,330	132,000	8,000	186,000
Secondary, stainless steel scrap and waste and scrap	do.	47,300	424,000	48,300	609,000
Wrought, not alloyed, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes	do.	2,890	34,400	1,120	16,400
Alloyed, unwrought ingot, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes, other alloyed articles, gross weight	do.	25,900	427,000	29,700	566,000

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003		2004	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Platinum-group metals:					
Palladium, Pd content	kilograms	22,300	110,000	31,400	142,000
Platinum, includes waste and scrap, Pt content	do.	45,900	722,000	43,300	825,000
Iridium, osmium, ruthenium, gross weight	do.	145	2,110	629	3,190
Rhodium, Rh content	do.	479	15,100	311	7,800
Rare earths, estimated rare-earth oxide content:					
Cerium compounds	do.	1,910,000	10,100	2,280,000	12,600
Compounds, inorganic and organic	do.	1,790,000	19,900	4,800,000	18,900
Metals, including scandium and yttrium	do.	730,000	3,250	1,010,000	6,050
Ferrocerium and other pyrophoric alloys	do.	2,880,000	10,700	3,720,000	16,800
Selenium, Se content	do.	249,000 r	2,450 r	160,000	2,810
Silicon, gross weight:					
Ferrosilicon	metric tons	11,600	10,400	11,500	11,700
Metal	do.	20,100	368,000	18,600	489,000
Silver:					
Bullion, Ag content	kilograms	135,000	20,700	302,000	64,500
Dore, Ag content	do.	19,800	3,190	79,800	18,800
Metal powder, gross weight	do.	473,000	81,500	708,000	122,000
Nitrate, gross weight	do.	69,200	9,120	61,500	5,720
Ores and concentrates, Ag content	do.	57,900	16,200	1,560	306
Semimanufactured forms containing 99.5% or more by weight of silver, gross weight	do.	344,000	59,400	269,000	48,300
Waste and scrap, gross weight	do.	2,380,000 r	555,000 r	2,240,000	424,000
Unwrought, other, gross weight	do.	26,000	5,470	39,600	8,690
Thallium, unwrought powders, waste and scrap, others	do.	2,090	203	1,190	276
Thorium and thorium-bearing materials, thorium ore, monazite concentrate, compounds	do.	23,600 r	171 r	731	298
Tin:					
Ingots and pigs	metric tons	3,690	18,500	3,650	25,700
Tin scrap and other tin bearing material, except tinplate scrap, includes rods, profiles, wire, powders, flakes, tubes, pipes	do.	24,500	32,600	16,800	42,900
Tinplate and terneplate	do.	263,000	154,000	262,000	169,000
Titanium:					
Metal, waste and scrap, unwrought, wrought products and castings, ferrotitanium and ferrosilicon titanium	do.	19,500	382,000	25,200	421,000
Ores and concentrates	do.	10,300	2,720	8,690	3,370
Pigment, dioxide and oxide	do.	584,000	958,000	635,000	1,090,000
Tungsten, W content:					
Ammonium paratungstate	do.	99	543	125	722
Carbide powder	do.	1,690 e	19,700	1,440 e	24,200
Metal powders	do.	1,130 e	24,100	433 e	18,700
Miscellaneous tungsten-bearing materials, ferrotungsten, ferrosilicon tungsten, unwrought, waste and scrap, wrought, compounds	do.	2,150	34,700	1,730	43,700
Ores and concentrates	do.	20 e	630	43 e	959
Vanadium:					
Aluminum-vanadium master alloy, gross weight	kilograms	9,590,000 r	22,800 r	14,600,000	32,100
Ferrovanadium, V content	do.	424,000	5,740	285,000	9,210
Metal, including waste and scrap, gross weight	do.	201,000	3,910	522,000	7,760
Pentoxide, anhydride, V content	do.	791,000	4,720	598,000	4,270
Other oxides and hydroxides, V content	do.	438,000	3,810	823,000	6,230
Zinc:					
Compounds, chloride, compounds, n.s.p.f., oxide, sulfate	do.	22,600	27,900	27,200	38,100
Ores and concentrates, Zn content	do.	841,000	377,000	744,000	413,000
Rolled	do.	9,430	9,880	9,770	12,700
Slab	do.	1,680	1,760	3,300	5,330

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Metals—Continued:					
Zirconium:					
Ferrozirconium	kilograms	1,930	2,030	913	1,310
Ores and concentrates	do.	70,600	37,600	68,800	45,500
Oxide, includes germanium oxides and zirconium dioxides	do.	1,520	15,900	1,600	18,100
Unwrought powders	do.	101	2,400	138	2,600
Waste and scrap	do.	1,590	94,000	1,560	92,400
Total		XX	27,800,000	XX	36,700,000
Industrial minerals:					
Abrasives, manufactured:					
Aluminum oxide, crude	do.	11,800	34,600	13,900	41,200
Metallic abrasives	do.	22,000	14,600	26,500	20,600
Silicon carbide, crude, ground and refined	do.	13,200	12,100	13,900	14,600
Asbestos, includes reexports:					
Manufactured		NA	290,000	NA	341,000
Unmanufactured	metric tons	2,820	920	1,580	333,000
Barite, natural barium sulfate	do.	44,400	4,620	69,900	6,400
Boron minerals and compounds:					
Boric acid, includes orthoboric and anhydrous		70	36,400	61	35,000
Sodium borates		131	55,400	135	60,200
Bromine:					
Compounds, includes methyl bromine and ethylene dibromide, Br content	metric tons	6,040	11,800	6,600	13,800
Elemental, gross weight	do.	2,280	3,090	2,840	2,070
Cement, hydraulic and clinker		837	61,600	818	63,000
Clays:					
Ball		139	8,430	107	8,200
Bentonite		721	88,100	915	105,000
Fire		285	27,400	332	32,300
Fuller's earth		48	8,830	49	10,300
Kaolin		3,520	574,000	3,640	600,000
Other, n.e.c., includes chamotte or dinas earth, activated clays and earths, artificially activated clays		416	153,000	586	181,000
Diamond:					
Gemstones, natural, including reexports	thousand carats	16,500	5,010,000 r	19,800	6,600,000
Industrial including exports and reexports:					
Unworked	do.	2,710	23,100	2,340	21,700
Powder, dust and grit, natural and synthetic	do.	81,100	46,700	97,900	51,600
Diatomite		136	43,300	143	53,700
Feldspar	metric tons	8,950	1,310	9,630	1,420
Fluorspar	do.	30,700	4,610	20,600	3,200
Garnet, industrial[e]		11	7,460	11	8,990
Graphite, natural and artificial	metric tons	91,900	97,500	94,900	117,000
Gypsum and gypsum products:					
Crude		166	18,600	149	15,000
Plasters		161	31,000	332	31,800
Boards		50	39,300	83	51,100
Other		XX	21,800	XX	29,300
Helium, Grade-A	million cubic meters	41	78,200	45	87,400
Iodine:					
Crude/resublimed	metric tons	1,590	19,600	1,270	11,800
Potassium iodide	do.	51	1,010	101	1,970
Iron oxide pigments and hydroxides:					
Pigment grade	do.	4,500	11,000	3,120	7,380
Other grade	do.	48,800	32,700	72,700	41,800
Kyanite, andalusite, sillimanite		28	4,930	32	5,880

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003		2004	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Lime		98	13,700	100	14,200
Lithium chemicals:					
Carbonate	metric tons	2,980	9,910	3,910	12,200
Hydroxide	do.	5,830	21,400	5,780	20,000
Magnesium compounds:					
Compounds, chlorides, hydroxide and peroxide, sulfates	do.	31,300	17,000	41,100	18,100
Magnesite, crude and processed:					
Caustic-calcined magnesia	do.	4,060	2,330	3,720	2,200
Dead-burned and fused magnesia	do.	56,500	20,900	29,900	17,300
Other magnesia	do.	27,500	18,800	23,800	18,200
Crude	do.	18,000	2,030	19,500	2,250
Mica:					
Scrap and flake:					
Powder	do.	8,020	5,190	7,200	4,780
Waste	do.	2,350	794	2,730	731
Sheet:					
Unworked	do.	33 r	99	29	58
Worked	do.	821	12,300	935	11,100
Peat		29	3,090	29	3,390
Perlite, crude and expanded[e]	metric tons	37,000	1,410	37,000	1,500
Pumice and pumicite		26	11,000	27	7,000
Salt		718	37,500	1,110	47,600
Sand and gravel:					
Construction:					
Sand		1,180	20,700	124	27,500
Gravel		593	4,180	553	4,610
Industrial		2,620	155,000	1,790	174,000
Silica, special stone products		NA	7,800	NA	8,900
Soda ash		4,450	515,000	4,670	514,000
Stone:					
Crushed		1,010	45,600	1,280	54,500
Dimension		XX	63,500	XX	63,700
Strontium compounds:					
Carbonate, precipitated	metric tons	375	452	360	266
Oxide, hydroxide, peroxide	do.	653	374	469	477
Sulfur:					
Elemental		840 r	54,400 r	949	63,300
Sulfuric acid, 100% H_2SO_4	metric tons	205,000	18,900 r	204,000	21,300
Talc, excludes powders, talcum (in package), face, compact		192	39,100	202	39,600
Vermiculite[e]		15	2,050	10	1,600
Wollastonite[e]		4,000	1,600	12,500	3,750
Zeolites[e]	metric tons	1,000	200	1,000	200
Total		XX	7,980,000	XX	10,200,000
Grand total		XX	35,700,000	XX	46,900,000

[e]Estimated. [r]Revised. NA Not available. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 8

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Metals:					
Aluminum:					
Crude and semicrude	metric tons	4,130,000	6,840,000	4,720,000	9,240,000
Manufactures	do.	271,000	642,000	288,000	756,000
Antimony:					
Metal	do.	4,670	10,800	8,270	19,100
Ore and concentrate, antimony content	do.	412	1,010	1,750	4,900
Oxide, antimony content	do.	21,600	54,400	23,500	67,200
Arsenic:					
Acid	do.	1 r	6 r	22	32
Metal	do.	990	3,040	872	3,030
Sulfide	do.	(2) r	5 r	(2)	2
Trioxide	do.	27,300	13,800	8,090	4,080
Bauxite and alumina:					
Alumina, calcined equivalent		2,310	571,000	1,650	533,000
Bauxite:					
Calcined, refractory and other grade		307	25,700	341	36,900
Crude and dried		8,390	137,000	10,000	186,000
Speciality aluminum compounds, sulfate, chloride, fluoride-based	metric tons	16,300	9,360	11,900	6,360
Beryllium, ore, concentrates, oxide, hydroxide, unwrought including powders, waste and scrap, other, beryllium-copper master allys, beryllium-copper plates, sheets, strip[3]	kilograms	767,000	6,060	1,280,000	14,200
Bismuth, metallic	do.	2,320,000	14,400	1,980,000	14,500
Cadmium:					
Metal	do.	18,000	383	38,000	127
Sulfide, gross weight	do.	7,470	53	1,810	23
Chromium:					
Chromite ore	metric tons	173,000	9,290	153,000	17,500
Metals and alloys:					
Ferrochromium-silicon	do.	38,700	24,900	30,600	31,500
Metal, unwrought powders, waste and scrap, other	do.	8,570	45,200	9,630	56,000
Chemicals:					
Oxides, hydroxides, trioxides and other	do.	16,600	26,500	9,960	18,900
Sulfates	do.	162	194	111	161
Salts of oxometallic or peroxometallic acids, zinc and lead chromate, sodium dichromate, potassium dichromate, other	do.	3,650	2,750	1,880	3,430
Carbide	do.	203	2,340	138	1,630
Pigments and preparations based on chromium	do.	8,290	21,700	7,540	20,200
Cobalt:					
Metal:					
Alloys, unwrought, waste and scrap, wrought, cobalt articles	do.	678	15,400	1,330	29,500
Unwrought, excluding alloys and waste and scrap, includes cathode and metal powder, may include intermediate products of cobalt metallurgy	do.	6,700	135,000	7,250	311,000
Oxide and hydroxides	do.	1,370	23,000	1,300	45,100
Other forms, includes acetates, carbonates, chlorides, sulfates	do.	1,350	8,350	1,720	22,100
Columbium (niobium) and tantalum:					
Columbium:					
Ores and concentrates	do.	23	610	5	41
Oxide	do.	837	12,200	906	13,900
Ferrocolumbium	do.	6,280	54,700	7,950	69,000
Unwrought, alloys, metal, powder	do.	743	16,400	940	18,500
Tantalum:					
Ores and concentrates, includes synthetic concentrates	do.	1,580	60,100	--	--
Unwrought, waste and scrap, powders, alloys, metal	do.	441	57,700	1,060	138,000
Wrought	do.	32	7,760	38	10,000

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Metals—Continued:					
Copper:					
Unmanufactured, does not include unalloyed scrap, copper content	metric tons	1,070,000	1,990,000	983,000	2,650,000
Semimanufactures	do.	427,000	939,000	390,000	1,270,000
Scrap, alloyed and unalloyed	do.	90,600 r	124,000	102,000	187,000
Ferroalloys not listed elsewhere:					
Ferrophosphorus	do.	11,700	2,250	7,280	1,840
Other	do.	16,200	19,000	8,520	12,700
Gallium:					
Unwrought and waste and scrap	kilograms	14,300	3,520	19,400	4,130
Gallium arsenide wafers, doped and undoped	do.	142,000 r	108,000 r	230,000	154,000
Germanium, wrought, unwrought, waste and scrap, gross weight	do.	8,380	6,310	9,130	7,260
Gold:					
Ores and concentrates	do.	1,960	23,300	1,860	19,200
Dore and precipitates	do.	95,200	832,000	142,000	1,590,000
Bullion, refined	do.	152,000	1,810,000	139,000	1,830,000
Waste and scrap	do.	15,000	133,000	20,500	161,000
Metal powder	do.	4,080	43,000	10,900	59,400
Compounds	do.	31,800	785	60,000	1,530
Indium, unwrought and waste and scrap	do.	123,000	16,600	143,000	58,800
Iron and steel:					
Steel mill products		21,000	10,400,000	32,500	21,400,000
Fabricated steel products		4,300	6,770,000	4,740	8,260,000
Cast iron and steel products		545	445,000	611	638,000
Stainless steel	metric tons	526,000	2,040,000	560,000	2,490,000
Iron and steel scrap:					
Ferrous, includes tinplate and ternplate, excludes used rails for rerolling and other uses and ships, boats, and other vessels for scrapping		3,480 r	511,000 r	4,660	1,230,000
Pig iron, all grades		3,890 r	571,000 r	6,400	1,360,000
Direct-reduced iron, steelmaking grade		1,940 r	242,000 r	2,450	463,000
Ships, boats, and other vessels for scrapping		3	583	(2)	128
Used rails for rerolling and other uses, includes mixed (used plus new) rails		207	45,600	132	44,100
Iron ore		12,600	328,000	11,800	371,000
Lead:					
Pigs and bars, Pb content	metric tons	175,000	92,400	197,000	175,000
Pigments and compounds, Pb content	do.	36,000	50,100	33,200	48,000
Scrap, reclaimed, includes ash and residues, Pb content	do.	4,150	2,360	4,780	3,510
Wrought, all forms, including wire and powders, gross weight	do.	7,780	17,800	11,000	25,200
Magnesium:					
Waste and scrap, gross weight	do.	16,200	22,000	11,700	17,600
Metal, gross weight	do.	27,300	53,600	34,300	78,200
Alloys, Mg content	do.	38,800	98,900	51,500	152,000
Powder, sheets, tubing, ribbons, wire, other forms, Mg content	do.	1,160	10,300 r	1,200	10,200
Manganese:					
Ores and concentrates with 20% or manganese, all grades, Mn content	do.	175,000	27,000	234,000	37,700
Ferromanganese, all grades, Mn content	do.	187,000	117,000	403,000	418,000
Silicomanganese, Mn content	do.	182,000	133,000	269,000	386,000
Metal, unwrought, other wrought, waste and scrap, gross weight	do.	19,800	20,800	34,700	49,900
Chemicals, manganese dioxide and potassium permanganate, gross weight	do.	50,900	64,700	27,600	33,000
Mercury:					
Metal	do.	46	914	92	1,350
Amalgams of precious metals whether or not chemically defined	do.	42	28,200	78	100,000

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Metals—Continued:					
Molybdenum:					
Ores and concentrates, including roasted and other, Mo content	metric tons	5,190	51,400	8,780	268,000
Chemicals, gross weight:					
Oxides and hydroxides	do.	1,300	9,600	822	15,800
Molybdates, all	do.	1,940	12,600	2,200	19,800
Orange	do.	987	4,310	1,030	4,760
Ferromolybdenum, Mo content	do.	3,690	37,500	5,310	158,000
Other, includes powders, unwrought, bars and rods, waste and scrap, wire, other, gross weight	do.	712	15,400	896	34,300
Nickel, Ni content:					
Primary, chemicals and unwrought	do.	125,000	1,150,000	136,000	1,890,000
Secondary, stainless steel scrap and waste and scrap	do.	11,500	108,000	18,800	250,000
Wrought, not alloyed, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes	do.	659	13,400	797	20,300
Alloyed, unwrought ingot, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes, other alloyed articles	do.	18,300	277,000	19,900	349,000
Platinum-group metals, metal content:					
Platinum, grains and nuggets, sponge, other unwrought, other, waste and scrap, coins	do.	88,400	1,770,000	86,400	2,200,000
Palladium, unwrought and other	do.	105,000	663,000	127,000	931,000
Iridium, unwrought and other forms	kilograms	2,200	6,090	3,230	18,000
Osmium, unwrought	do.	53	430	75	421
Ruthenium, unwrought	do.	15,900	16,700	18,800	35,900
Rhodium, unwrought and other forms	do.	12,000	202,000	13,200	397,000
Rare earths, estimated equivalent rare-earth oxide (REO) content:					
Cerium compounds, including oxides, hydroxides, nitrates, sulfate chlorides, oxalates	do.	2,430,000	15,100	1,880,000	25,900
Yttrium compounds content by weight greater than 19% but less than 85% oxide equivalent	do.	51,900	4,330	136,000	3,510
Compounds, including oxides, hydroxides, nitrates, other compounds except chlorides	do.	9,580,000	55,500	11,400,000	64,100
Mixtures of REO's except cerium oxide	do.	1,710,000	6,100	1,660,000	4,930
Metals, whether intermixed or alloyed	do.	884,000 r	5,140	804,000	3,500
Mixtures of rare-earth chlorides, except cerium chloride	do.	1,910,000	6,210	1,310,000	6,870
Ferrocerium and other pyrophoric alloys	do.	102,000	1,650	105,000	1,770
Rhenium:					
Metal	do.	13,200	14,400	11,800	12,900
Ammonium perrhenate	do.	1,990	1,560	12,100	7,560
Selenium and tellurium:					
Selenium, Se content:					
Selenium	do.	353,000	4,410	402,000	16,000
Dioxide	do.	14,500	169	10,300	293
Tellurium, Te content	do.	48,900	1,610	62,800	2,620
Silicon, gross weight:					
Ferrosilicon	metric tons	270,000	183,000	247,000	201,000
Metal	do.	128,000	220,000	167,000	314,000
Silver:					
Ash and residues, Ag content	kilograms	1,340	266	6,710	1,530
Bullion, Ag content	do.	4,000,000	630,000	3,410,000	728,000
Dore, Ag content	do.	233,000	72,200	346,000	117,000
Metal powder, gross weight	do.	20,800	4,160	27,400	6,920
Nitrate, gross weight	do.	661	96	--	--
Ores and concentrates, Ag content	do.	2,540	1,370	2,220	1,410
Semimanufactured forms containing 99.5% or more by weight of silver, gross weight	do.	17,000	2,700	52,300	11,900
Waste and scrap, gross weight	do.	886,000	107,000	2,020,000	160,000
Unwrought, other, gross weight	do.	281,000	42,200	342,000	69,600
Thallium, unwrought powders, waste and scrap, other	do.	81	20	325	117
Thorium and thorium-bearing materials, compounds	do.	4,140	149	5,320	170

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Metals—Continued:					
Tin, gross weight:					
Compounds	metric tons	443	3,000	635	6,030
Dross, skimmings, scrap, residues, alloys, n.s.p.f.	do.	3,290	10,500	5,790	24,500
Metal, unwrought	do.	37,000	169,000	47,600	390,000
Miscellaneous, includes tinfoil, tin powder, flitters, metallics, manufactures, n.s.p.f.	do.	NA	3,510	NA	7,080
Tinplate and terneplate	do.	282,000	173,000	328,000	215,000
Tinplate scrap	do.	20,100	3,390	9,650	2,020
Titanium:					
Concentrate:					
Ilmenite	metric tons	395,000	39,500	244,000	40,900
Rutile, natural and synthetic	do.	427,000	162,000	360,000	165,000
Metal:[3]					
Waste and scrap	do.	5,550	19,700	8,830	53,600
Unwrought	do.	9,590	63,500	11,900	79,500
Ingots	do.	663	6,710	1,530	14,800
Billets, bloom, sheet, bar, slab	do.	113	3,860	XX	XX
Powder	do.	129	1,890	142	2,840
Other	do.	669	3,370	959	8,350
Wrought products and castings, includes bar, castings, foil, pipe, plate, profile, rod, sheet, strip, tube, wire, other	do.	3,640	82,600	3,590	91,500
Ferrotitanium and ferrosilicon titanium	do.	3,160	9,670	6,940	21,200
Pigment, dioxide and oxide	do.	240,000	397,000	264,000	413,000
Titaniferous iron ore	do.	18,900	1,390	68,700	3,650
Titaniferous slag	do.	409,000	163,000	457,000	192,000
Tungsten, W content:					
Ammonium paratungstate	do.	2,640	16,300	2,090	16,500
Ferrotungsten and ferrosilicon tungsten	do.	377	2,380	392	3,510
Miscellaneous tungsten-bearing materials, metal powders, carbide powder, unwrought, waste and scrap, wrought, oxides, calcium tungstate, other tungstates, other compounds	do.	4,600	64,100	5,750	92,400
Ores and concentrates	do.	4,690	26,200	2,310	14,600
Vanadium:					
Aluminum-vanadium master alloy, gross weight	kilograms	232,000	425	19,100	67
Ferrovanadium, V content	do.	1,690,000	14,300	3,740,000	62,100
Metal, including waste and scrap, gross weight	do.	186,000	2,850	31,200	1,710
Miscellaneous chemicals, sulfates and vanadates, V content	do.	72,900	902	197,000	1,170
Pentoxide, anhydride, V content	do.	679,000 r	3,610	1,230,000	8,600
Vanadium-bearing ash, residues, slag from the manufacture of iron and steel, V_2O_5 content	do.	3,960,000	5,760	16,400,000	11,800
Other oxides and hydroxides, V content	do.	74,300	769	133,000	1,650
Zinc:					
Compounds, lithopone, chloride, compounds n.s.p.f., hydrosulfite, oxide, sulfate oxide, sulfate	metric tons	126,000	85,800	137,000	107,000
Ores and concentrates, Zn content	do.	164,000	60,000	231,000	98,700
Rolled	do.	1,790	5,500	2,500	9,250
Slab, refined	do.	758,000 r	647,000	812,000	888,000
Zirconium and hafnium:					
Hafnium, unwrought, including powders	do.	5	911	4	895
Zirconium:					
Ferrozirconium	do.	154	245	165	318
Ores and concentrates	do.	37,400	14,800	35,200	16,800
Oxide, includes germanium oxides and zirconium oxides	do.	2,350	22,300	3,690	33,000

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003		2004	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Zirconium and hafnium—Continued:					
Zirconium—Continued:					
Unwrought powder	metric tons	52	2,260	74	2,320
Waste and scrap	do.	491	42,200	722	45,600
Total		XX	45,000,000	XX	69,000,000
Industrial minerals:					
Abrasives, manufactured:					
Aluminum oxide, crude, ground and refined	metric tons	164,000	67,000	232,000	98,100
Metallic abrasives	do.	16,500	9,650	15,900	9,520
Silicon carbide, crude, ground and refined	do.	170,000	78,900	209,000	119,000
Asbestos:					
Chrysotile and other unspecified type	do.	4,650	5,840	3,450	806
Products with basis of asbestos, cellulose, or other minerals		NA	577,000	NA	616,000
Barite:					
Chemicals; chloride, oxide, hydroxide, peroxide, nitrate, precipitated carbonate	metric tons	18,300	16,000	18,200	14,600
Crude	do.	1,620,000	68,200	1,960,000	90,600
Ground	do.	174	15	5,100	700
Other sulfates	do.	32,800	17,300	33,800	17,800
Boron minerals and compounds:					
Borax		(2)	19	(2)	62
Boric acid		47	19,000	49	20,300
Colemanite		24	6,960	21	6,070
Ulexite		80	16,000	110	21,900
Bromine:					
Compounds, contained bromine	metric tons	7,900	49,500	7,580	30,100
Elemental	do.	1,920	1,450	2,650	2,000
Cement, hydraulic and clinker		24,000 r	940,000 r	27,300	1,140,000
Clays:					
China clay or kaolin	do.	224,000	34,700	205,000	38,600
Fire clay	do.	482	245	5,920	1,680
Decolorizing earths and fuller's earth	do.	2,590	28	227	48
Bentonite	do.	12,700	3,010	9,340	3,360
Common blue clay and other ball clay	do.	13,300	1,220	520	218
Other clay	do.	5,060	2,580	5,430	3,650
Chamotte or dina's earth	do.	3	5	2	2
Artifically activated clay and activated earth	do.	21,000	9,430	24,900	14,200
Diamond, industrial:					
Diamond stones, natural and miners'	thousand carats	1,820	5,640	1,780	13,800
Powder, dust and grit, natural and synthetic	do.	250,000	64,600	240,000	61,200
Diatomite	metric tons	1,710	675	1,710	488
Feldspar and nepheline syenite:					
Feldspar	do.	7,980	1,010	20,600	944
Nepheline syenite	do.	307,000	28,200	350,000	29,000
Fluorspar:					
Aluminum fluoride	do.	10,100	7,640	4,700	3,750
Cryolite	do.	8,120	6,120	3,860	3,660
Fluorspar	do.	567,000	76,300	599,000	95,300
Hydrofluoric acid, HF	do.	111,000	115,000	128,000	131,000
Garnet, industrial[e]		31	3,190	37	4,260
Gemstones		XX	13,600,000	XX	15,500,000
Graphite:					
Natural	metric tons	52,300	24,400	63,700	29,900
Electric furnace electrodes	do.	85,300	139,000	86,400	144,000

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003		2004	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Gypsum:					
Crude		8,300	75,500	10,100	97,200
Plasters		6	3,040	5	3,420
Boards		484	59,600	617	87,100
Other		XX	45,800	XX	43,200
Iodine:					
Crude	metric tons	5,750	68,300	5,700	75,300
Potassium iodide	do.	863 r	9,760	892	11,500
Iron oxide pigments:					
Natural	do.	4,000	2,150	4,100	2,100
Synthetic	do.	136,000	94,500	166,000	114,000
Kyanite, andalusite, sillimanite	do.	4,480	1,090	4,010	1,420
Lime		202	22,500	232	25,900
Lithium chemicals:					
Carbonate	metric tons	11,600	18,000	15,400	26,500
Hydroxide	do.	111	601	64	233
Magnesium compounds:					
Compounds, chlorides, hydroxide, peroxide, sulfates	do.	112,000	35,700	132,000	40,600
Magnesite, crude and processed:					
Caustic-calcined magnesia	do.	150,000	22,600	157,000	22,200
Dead-burned and fused magnesia	do.	379,000	78,500	418,000	109,000
Other magnesia	do.	21,000	10,300	15,700	10,800
Crude	do.	14,300	1,740	15,900	1,980
Mica:					
Scrap and flake:					
Powder	do.	20,600	10,600	22,300	10,800
Waste	do.	14,300	3,360 r	20,100	4,410
Sheet:					
Unworked, excludes unworked sheet mica valued at less than $1 per kilogram	do.	134	350	124	358
Worked	do.	1,000	11,100	1,280	11,800
Nitrogen, major compounds, gross weight[3]		15,800	2,920,000	16,000	3,580,000
Peat moss	metric tons	767,000	148,000	786,000	159,000
Perlite, processed crude	do.	245,000	9,310	238,000	9,660
Phosphate rock and phosphatic materials		2,680	176,000	2,690	178,000
Potash, chloride, sulfate, nitrate, sodium nitrate mixtures	metric tons	7,810,000	646,000	8,140,000	763,000
Pumice:					
Crude or unmanufactured		366	32,800	401	31,400
Wholly or partially manufactured		1	3,460	1	3,660
Salt		12,900	196,000	11,900	159,000
Sand and gravel:					
Construction		4,410	57,700	4,760	56,900
Industrial		440	9,210	490	12,400
Silica, special stone products		NA	6,300	NA	6,800
Soda ash		5	1,510	6	1,880
Stone:					
Crushed, chips, calcium carbonate fines, excludes precipitated carbonates		15,300	143,000	16,000	149,000
Dimension		NA	1,390,000	NA	1,790,000
Strontium:					
Carbonate	metric tons	38,200	18,200	23,600	8,430
Celestite	do.	2,320	132 r	6,290	332
Metal	do.	283	1,090	217	1,070
Nitrate	do.	705	2,080	527	798
Oxide, hydroxide, peroxide	do.	--	--	98	76

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2003 Quantity	2003 Value	2004 Quantity	2004 Value
Industrial minerals—Continued:					
Sulfur:					
Elemental		2,870 e	70,600	2,850 e	76,800
Sulfuric acid, 100% H_2SO_4	metric tons	908,000	39,200	2,400,000	104,000
Talc		237	53,500	226	58,400
Vermiculite[e]		37	6,200	69	10,000
Wollastonite[e]		3,500	525	4,500	563
Total		XX	22,500,000	XX	26,100,000
Grand total		XX	67,500,000	XX	95,100,000

[e]Estimated. [r]Revised. NA Not available. XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

[3]Category regrouped in 2004, see commodity chapter for details.

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TABLE 9

WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Mineral or product		World total					United States	
		2000	2001	2002	2003	2004	2004	Percentage of world total
Metals:								
Aluminum[2]		24,300	24,300	26,100 r	27,900 r	29,800	2,520	8.4
Antimony	metric tons	126,000	157,000	113,000	112,000 r	113,000	--	--
Arsenic trioxide[3]	do.	62,800 r	59,500 r	59,100 r	58,900 r	49,500	--	--
Bauxite[3,4,5]		136,000	137,000 r	144,000 r	155,000 r	159,000	NA	NA
Beryl[3]	metric tons	5,060 r	2,990 r	2,540 r	2,700 r	2,810	2,210	78.7
Bismuth, refinery	do.	4,230	5,050	6,330 r	8,540 r	7,980	--	--
Cadmium, refinery	do.	20,300 r	19,000 r	17,500 r	18,500 r	18,800	550	2.9
Chromite[3]		14,700 r	12,100	14,200	15,500	17,500	--	--
Cobalt, Co content:								
Mine	metric tons	37,900 r	47,900 r	50,700 r	48,700 r	52,400	--	--
Refinery	do.	36,000 r	39,600 r	41,700 r	43,800 r	49,100	--	--
Columbium (niobium)-tantalum concentrates[3]	do.	61,100	76,600	81,200 r	80,800 r	68,000	--	--
Copper:								
Mine		13,300 r	13,700	13,700 r	13,700 r	14,600	1,160	8.0
Refinery		14,900	15,600 r	15,400 r	15,200	15,800	1,310	8.3
Gold	kilograms	2,570,000 r	2,560,000 r	2,550,000 r	2,550,000 r	2,430,000	258,000	10.6
Iron ore[3]		1,080,000	1,040,000 r	1,090,000 r	1,190,000 r	1,340,000	54,700	4.1
Iron and steel:								
Direct-reduced iron[2]		42,400	39,300	43,600 r	45,200 r	48,100	180	0.4
Pig iron[2]		573,000	585,000	610,000 r	663,000 r	712,000	42,300	5.9
Raw steel		850,000	853,000 r	906,000	972,000 r	1,050,000	100,000	9.5
Lead:								
Mine	metric tons	3,170,000	3,120,000 r	2,870,000 r	3,140,000 r	3,110,000	445,000	14.3
Refinery	do.	6,650,000 r	6,570,000 r	6,630,000	6,800,000 r	6,740,000	1,260,000	18.7
Magnesium[5]	do.	422,000 r	428,000 r	452,000 r	496,000 r	584,000	W	NA
Manganese ore[3]		19,600	20,900 r	22,200	24,100 r	26,300	--	--
Mercury[5]	metric tons	1,360	1,500	1,490 r	1,410 r	1,260	NA	NA
Molybdenum, Mo content	do.	135,000 r	132,000 r	121,000	130,000 r	141,000	41,500	29.5
Nickel, Ni content:								
Mine	do.	1,290,000	1,340,000 r	3,150,000 r	1,390,000 r	1,390,000	--	--
Refinery	do.	1,120,000	1,170,000 r	1,180,000 r	1,220,000 r	1,260,000	--	--
Platinum-group metals	kilograms	364,000	395,000	414,000	452,000 r	467,000	17,700	3.8
Selenium[2,5]	do.	1,460,000	1,460,000	1,410,000 r	1,470,000 r	1,330,000	W	NA
Silver	metric tons	18,100 r	18,900 r	18,500 r	18,400 r	19,700	1,250	6.3
Tellurium[2,5]	kilograms	111,000	109,000	89,000 r	95,000 r	95,000	W	NA
Tin:								
Mine	metric tons	278,000 r	249,000 r	238,000 r	263,000 r	262,000	--	--
Smelter[6]	do.	288,000	288,000 r	280,000	280,000 r	309,000	4,850	1.6
Tungsten, W content	do.	44,000	48,900 r	64,200 r	66,700 r	73,700	--	--
Zinc:								
Mine	do.	8,770,000	8,910,000	8,520,000 r	9,600,000 r	9,600,000	739,000	7.7
Smelter		9,020 r	9,270 r	9,690 r	9,860 r	10,000	305	3.0
Industrial minerals:								
Asbestos	metric tons	2,110,000	2,080,000 r	2,050,000	2,230,000 r	2,230,000	--	--
Barite	do.	6,560,000 r	6,740,000 r	6,440,000 r	6,650,000 r	7,240,000	532,000 [7]	7.3
Boron minerals	do.	4,550,000	4,730,000	4,560,000 r	4,750,000 r	4,410,000	1,210,000 [7]	27.4
Bromine	thousand kilograms	542,000	523,000	540,000	548,000	556,000	222,000 [7]	40.0
Celesite	metric tons	396,000 r	398,000 r	435,000 r	471,000 r	551,000	--	--
Cement, hydraulic		1,660,000	1,750,000 r	1,850,000 r	2,020,000 r	2,130,000	99,000 [8]	4.6
Clays:								
Bentonite		10,300	10,400	10,300	10,300 r	10,500	4,060	38.7
Fuller's earth	metric tons	4,470,000 r	4,600,000 r	4,520,000 r	5,390,000 r	5,060,000	3,260,000	64.4
Kaolin		44,700 r	45,100 r	43,300 r	44,400 r	44,400	7,760	17.5

See footnotes at end of table.

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TABLE 9—Continued

WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Mineral or product		World total					United States	
		2000	2001	2002	2003	2004	2004	Percentage of world total
Industrial minerals—Continued:								
Diamond, natural	thousand carats	122,000 r	127,000 r	140,000 r	159,000 r	156,000	--	--
Diatomite	metric tons	1,970,000 r	1,950,000 r	1,880,000 r	1,910,000 r	1,930,000	620,000 [7]	32.1
Feldspar		9,540	10,400	10,800 r	11,200 r	11,100	770	6.9
Fluorspar	metric tons	4,450,000 r	4,590,000 r	4,440,000 r	4,860,000 r	5,060,000	--	--
Graphite, natural	do.	846,000	803,000	929,000 r	974,000 r	982,000	--	--
Gypsum		108,000 r	105,000 r	104,000 r	107,000 r	111,000	17,200	15.5
Iodine, crude	thousand kilograms	19,500	20,700	21,000	24,600 r	24,700	1,130	4.6
Lime		121,000 r	121,000 r	119,000 r	124,000 r	126,000	20,000 [7,8]	16.0
Magnesite, crude[5]		12,700	11,100	13,600 r	14,000 r	14,500	W	NA
Mica, including scrap and flake[9]	metric tons	328,000 r	368,000 r	269,000 r	267,000 r	288,000	99,200	34.5
Nitrogen, N content of ammonia		108,000	105,000	109,000 r	110,000 r	117,000	8,850 [10]	7.6
Peat		24,700	25,700	28,500 r	26,000 r	27,600	696	2.5
Perlite	metric tons	1,940,000 r	1,730,000 r	1,820,000 r	1,880,000 r	1,950,000	508,000 [7]	26.1
Phosphate rock[3]		132,000	126,000	135,000	137,000	141,000	35,800	25.4
Potash, K_2O equivalent		27,000	26,400 r	26,600 r	28,400 r	28,900	1,300	4.5
Pumice		13,700	14,400 r	15,100 r	15,600 r	16,100	1,491 [7]	9.3
Salt		195,000 r	199,000 r	195,000 r	199,000 r	208,000	46,500 [8]	22.3
Sand and gravel, industrial, silica		114,000 r	114,000 r	113,000 r	113,000 r	115,000	29,700 [7]	25.8
Soda ash, natural and manufactured		34,300 r	35,500 r	36,800 r	38,000 r	40,300	11,000 [11]	27.2
Sulfur, all forms		59,300 r	59,500 r	60,600 r	61,900 r	64,100	10,110	15.8
Talc and pyrophyllite[12]	metric tons	8,730,000 r	9,060,000 r	7,810,000 r	8,320,000 r	8,320,000	857,000	10.3
Titanium concentrates:[3]								
Ilmenite and leucoxene	do.	4,940,000 r	5,110,000 r	5,420,000 r	5,690,000 r	5,640,000	500,000 [13]	8.9
Rutile[5]	do.	409,000 r	421,000 r	446,000 r	361,000 r	353,000	(14)	NA
Vermiculite	do.	521,000 r	431,000 r	498,000 r	491,000 r	510,000	100,000	19.6

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "World" total. -- Zero.

[1]Data are rounded to no more than three significant digits.

[2]Primary.

[3]Gross weight.

[4]Individual country figures that are included in the world total represent dried bauxite equivalent of crude ore, but for some countries available data are insufficient to permit this adjustment.

[5]"World total" for years listed does not include U.S. production.

[6]Includes tin content of alloys made directly from ore.

[7]Quantity sold or used by producers.

[8]Includes Puerto Rico.

[9]Excludes, if any, U.S. production of low-quality sericite and sheet mica.

[10]Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

[11]U.S. production is natural only.

[12]Data for the United States exclude proprietary pyrophyllite production.

[13]Includes rutile to avoid disclosing company proprietary data. Rounded to one significant digit.

[14]Included with ilmenite to avoid disclosing company proprietary data; not included in "Total."

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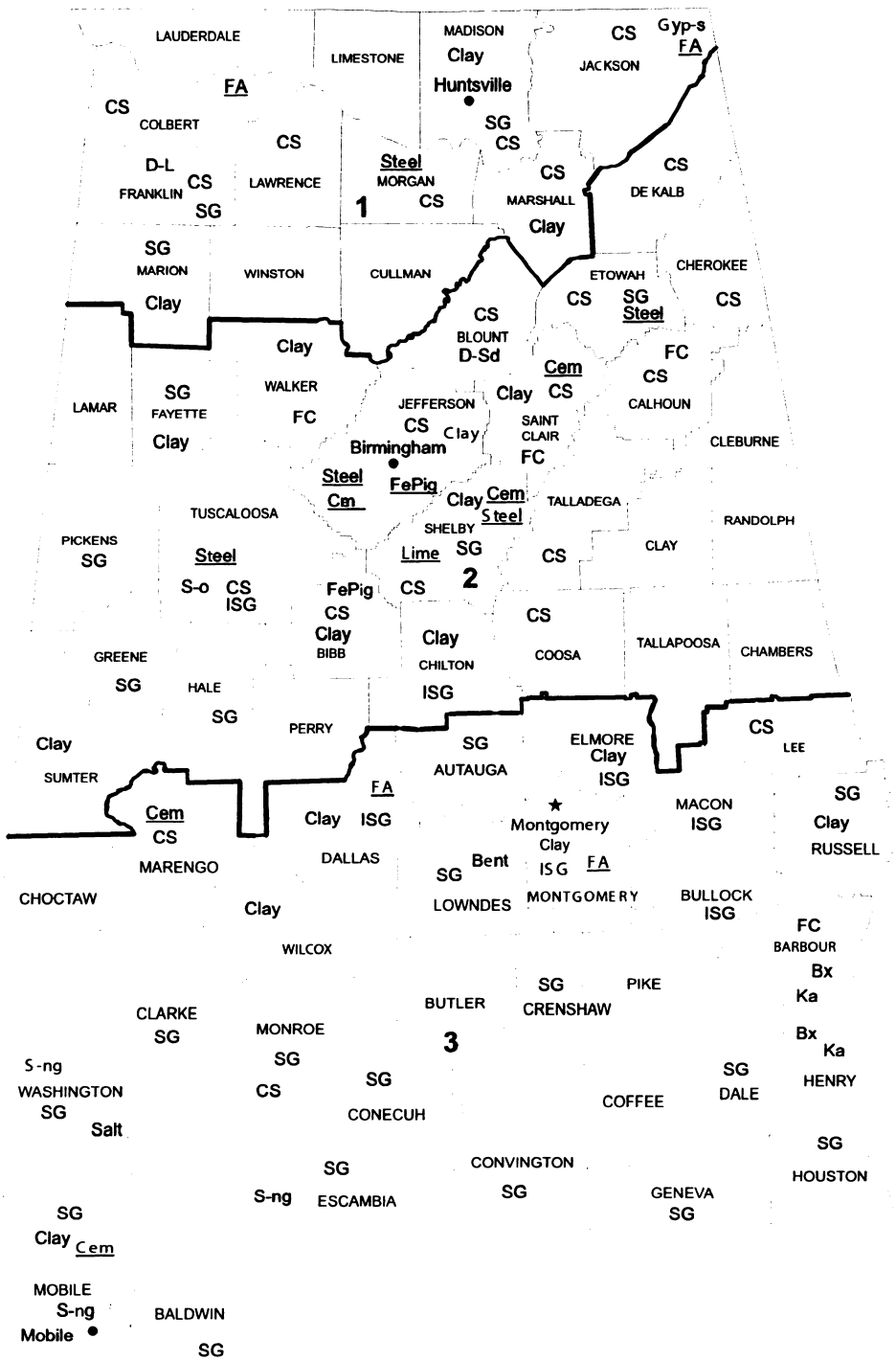
ALABAMA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 —— Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Bx	Bauxite
Clay	Common clay
Cem	Cement plant
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
FA	Ferroalloys plant
FC	Fire clay
FePig	Iron oxide pigments
FePig	Iron oxide pigment plant
Gyp-s	Synthethic gypsum
ISG	Industrial sand and gravel
Ka	Kaolin
Lime	Lime plant
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

0 50 Kilometers

Source: Geological Survey of Alabama/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF ALABAMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Alabama for collecting information on all nonfuel minerals.

In 2004, Alabama's nonfuel mineral production was valued[1] at $972 million, based upon annual U.S. Geological Survey (USGS) data. This was an 8% increase compared with that of 2003[2] following a 6.8% increase from 2002 to 2003. The State ranked 18th (17th in 2003) among the 50 States in total nonfuel mineral production value; Alabama accounted for more than 2% of the U.S. total.

The top four nonfuel mineral commodities produced in Alabama in 2004 continued to be, descending order of value, cement (portland and masonry), crushed stone, lime, and construction sand and gravel. These four commodities accounted for nearly 93% of the State's total nonfuel mineral production value; the combined value of cement and crushed stone represented about 69% of the total.

In 2004, the increased values of cement overall (portland and masonry), crushed stone, lime, and common clays led Alabama's rise in value with increases in value of nearly $41 million, $17 million, $13 million, and $5.6 million, respectively, despite small decreases in crushed stone and lime production. The largest decreases in value were for construction sand and gravel and dimension stone, which were down about $2 million each, and kaolin, which was down about $1 million (table 1).

In 2003, the State's rise in nonfuel mineral value resulted mostly from increases in crushed stone, $29 million; lime, $24 million; construction sand and gravel, nearly $11 million; and salt, about $7 million. The largest decrease in value was in cement (portland and masonry) overall about $11 million (table 1).

Nonfuel mineral production in Alabama consisted entirely of industrial minerals. Alabama continued to be the second ranked kaolin-producing State in 2004 and remained third in common clays and iron oxide pigments and eighth in salt. The State decreased to third from second in lime, to fourth from third in bentonite, to fifth from third in masonry cement, to seventh from sixth in portland cement, and to a virtual tie for ninth from eighth in gemstones (gemstones ranking based upon value). Additionally, Alabama was a producer of substantial quantities of, in descending order of value, crushed stone, construction sand and gravel, and industrial sand and gravel. All metal production in the State, especially that of raw steel, was the result of processing materials acquired from other domestic and foreign sources. Production of a natural mixture of bauxite (no longer used to produce primary aluminum) and bauxitic clay with very low iron oxide content has been reported to the USGS since 1995 as kaolin; it is primarily used to make refractory products.

The narrative information that follows was provided by the Geological Survey of Alabama[3] (GSA).

Exploration and Development

Mineral exploration in Alabama continued to focus on industrial mineral resources, resulting in increases of identified resources for several industrial minerals. The Alabama Development Office reported that recent capital investment in expanding industrial mineral operations from 2003 to 2004 was more than $63 million. This included brick/tile operations, calcium carbonate, cement, crushed stone, lime, and refractory clay. A new mica recovery operation began operations at Micaville, Randolph County. Muscovite flake mica occurs as finely disseminated flakes in the mica schist of the northern Alabama Piedmont. Scrap or flake mica is used by industry in dry-, wet-, or micronized-ground form.

Commodity Review

Industrial Minerals

In 2004, 166 companies or operations were involved in the mining and production of industrial nonfuel mineral resources in Alabama; the majority was for the mining of aggregates. This included 50 active limestone-dolomite operations for crushed stone. In addition, granite, quartzite and sandstone operations for crushed stone also were active. New granite operations were started in Lee and Randolph Counties.

According to 2004 reports, crushed stone production exceeded 49 million metric tons (Mt); this was another year of record-level production. Birmingham-based Vulcan Materials Co. remained the leading construction aggregate producer in the country. Marble operations were active for the production of micronized calcium carbonate and building stone. Alabama had 20 active clay (bentonite, common clay, fire clay, fuller's earth, kaolin, and shale) operations. Clay production was led by common clay followed by shale, fuller's earth, bentonite, fireclay, and kaolin.

Alabama had 81 active sand and gravel operations. Sand and gravel production came primarily from Quaternary alluvium and terrace deposits in Elmore, Macon, Montgomery, Russell,

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Lewis S. Dean, a Geologist at the Geological Survey of Alabama, authored the text of the State mineral industry information provided by that agency.

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and Tuscaloosa Counties and from the Citronelle Formation in Mobile County.

Other industrial mineral operations included chalk, building stone (limestone and sandstone), salt (solution recovery), bauxitic clays, silicon, and recovered sulfur.

Government Activities and Programs

The largest beach renourishment project along coastal Alabama was continued in 2004 by the City of Gulf Shores, which had initiated a project in 2003 to pump nearly 500,000 cubic meters of sand from the bottom of Little Lagoon to the Gulf of Mexico shoreline along West Beach.

In 2004, the GSA continued to publish 1:24,000-scale geologic maps in Alabama in conjunction with the STATEMAP program. STATEMAP is a component of the Congressionally mandated USGS National Cooperative Geological Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. This new geologic map information is being used in a variety of ways in these rapidly urbanizing parts of the State. For example, geologic mapping aided in the identification of supplies of industrial mineral resources (sand, gravel, and crushed stone) that support construction and infrastructure development. Published geologic 7.5-minute quadrangles during 2004 included the Trinity, Decatur, Jones Crossroads, and Tanner quads in the Limestone and the Morgan County areas of the Tennessee Valley and the Cooks Spring, Laniers, Springville, and Ragland quads in the Shelby and the St. Clair County areas of the Valley and Ridge geologic province.

More information on geology, hydrology, occurrence, mining history, and general economics of specific mineral resources in Alabama is available from the Geological Survey of Alabama. Much of this information, as well as contact information, is available over the Internet at URL http://www.gsa.state.al.us.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALABAMA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	380	42,000 e	565	55,700 e	430	49,400 e
Portland	4,540	298,000 e	4,330	273,000 e	4,800	320,000 e
Clays:						
Bentonite	125	3,810	125	3,810	100	3,050
Common	2,020	24,600	1,920	24,000	2,120	29,600
Kaolin	531	14,600	W	W	W	W
Gemstones	NA	356	NA	356	NA	356
Lime	2,040	127,000	2,290	151,000	2,280	164,000
Sand and gravel:						
Construction	12,500	56,700	14,500	67,600	14,700	65,300
Industrial	722	8,990	723	9,180	643	9,800
Stone, crushed	43,400	257,000 r	49,300	286,000	49,100	303,000
Combined values of iron oxide pigments (crude), salt, stone (dimension marble and sandstone), and values indicated by symbol W	XX	8,850	XX	30,000	XX	27,000
Total	XX	843,000 r	XX	900,000	XX	972,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
ALABAMA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	49	35,000	$205,000 r	$5.85 r	49	41,300	$239,000	$5.78	52	41,300	$244,000	$5.91
Dolomite	3	W	W	6.57	3	W	W	6.57	3	W	W	6.33
Marble	2	W	W	6.38	2	W	W	5.82	2	W	W	10.33
Sandstone	8	2,150	13,200	6.15	8	1,820	10,000	5.49	9	1,530	8,250	5.41
Granite	1	W	W	5.45	2	W	W	6.43	2	W	W	6.57
Slate	2	W	W	7.16	2	W	W	5.81	2	W	W	5.82
Miscellaneous stone	3	71	230	3.22	1	W	W	2.11	1	W	W	8.85
Total or average	XX	43,400	257,000 r	5.93 r	XX	49,300	286,000	5.80	XX	49,100	303,000	6.17

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3a
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregates (+1½ inch):			
Riprap and jetty stone	290	$1,310	$4.51
Other coarse aggregates	778	5,980	7.69
Total or average	1,070	7,290	6.82
Coarse aggregates, graded:			
Concrete aggregate, coarse	815	5,100	6.26
Bituminous aggregate, coarse	1,270	8,170	6.43
Bituminous surface-treatment aggregate	193	1,140	5.90
Other graded coarse aggregates	7,950	52,100	6.56
Total or average	10,200	66,500	6.51
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	5.84
Stone sand, bituminous mix or seal	W	W	4.79
Screening, undesignated	138	590	4.28
Other fine aggregates	2,510	13,900	5.52
Total or average	2,650	14,400	5.46
Coarse and fine aggregates:			
Graded road base or subbase	1,460	8,830	6.05
Crusher run or fill or waste	W	W	5.76
Roofing granules	W	W	3.94
Other coarse and fine aggregates	6,080	38,700	6.36
Total or average	7,540	47,500	6.30
Agricultural limestone	(2)	(2)	6.81
Chemical and metallurgical:			
Cement manufacture	4,150	12,700	3.05
Lime manufacture	(2)	(2)	6.92
Total or average	4,150	12,700	3.05
Other miscellaneous uses	231	444	1.92
Unspecified:[3]			
Reported	16,300	96,900	5.95
Estimated	7,200	40,000	5.61
Total or average	23,500	137,000	5.85
Grand total or average	49,300	286,000	5.80

W Withheld to avoid disclosing company proprietary data; included with "Other."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data, included in "Unspecified: Reported."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregates (+1½ inch):			
Riprap and jetty stone	152	$1,040	$6.85
Other coarse aggregates	785	6,270	7.98
Total or average	937	7,310	7.80
Coarse aggregates, graded:			
Concrete aggregate, coarse	1,530	9,080	5.93
Bituminous aggregate, coarse	1,880	11,900	6.32
Bituminous surface-treatment aggregate	133	1,360	10.22
Other graded coarse aggregates	8,170	52,900	6.47
Total or average	11,700	75,200	6.42
Fine aggregate (-⅜ inch):			
Stone sand, concrete	134	840	6.27
Stone sand, bituminous mix or seal	187	1,130	6.02
Screening, undesignated	303	1,550	5.12
Other fine aggregates	2,460	13,300	5.40
Total or average	3,080	16,800	5.45
Coarse and fine aggregates:			
Graded road base or subbase	2,410	13,100	5.43
Terrazzo and exposed aggregate	W	W	6.39
Crusher run or fill or waste	436	2,580	5.91
Other coarse and fine aggregates	7,260	59,000	8.13
Total or average	10,100	74,700	7.39
Other construction materials	413	2,600	6.30
Agricultural:			
Agricultural limestone	323	2,180	6.75
Other agricultural uses	160	528	3.31
Total or average	483	2,710	5.60
Chemical and metallurgical:			
Cement manufacture	2,550	6,180	2.43
Lime manufacture	(2)	(2)	7.61
Flux stone	(2)	(2)	6.50
Total or average	3,380	12,200	3.62
Special, other fillers or extenders	(3)	(3)	16.53
Unspecified:[4]			
Reported	12,600	75,400	5.98
Estimated	6,400	36,000	5.68
Total or average	19,000	112,000	5.88
Grand total or average	49,100	303,000	6.17

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data, included in "Total or average."

[3]Withheld to avoid disclosing company proprietary data, included in "Unspecified: Reported."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	(7)	(7)	(7)	(7)	(7)	(7)
Chemical and metallurgical[8]	--	--	(7)	(7)	(7)	(7)
Other miscellaneous uses	--	--	231	444	--	--
Unspecified:[9]						
Reported	2,780	15,700	11,700	69,500	1,840	11,700
Estimated	1,200	5,600	5,700	33,000	330	1,900
Total	12,400	71,000	32,900	191,000	3,990	23,900

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded aggregates.

[4]Includes screening (undesignated) and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[8]Includes cement and lime manufacture.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	4,480	28,000	6,810	44,300	418	2,880
Fine aggregate (-⅜ inch)[4]	1,030	6,110	2,000	10,400	56	259
Coarse and fine aggregate[5]	4,050	22,200	5,340	45,300	719	7,200
Other construction materials	413	2,600	--	--	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	(9)	(9)	--	--
Unspecified:[10]						
Reported	1,670	10,400	9,290	54,200	1,660	10,800
Estimated	1,300	6,900	5,100	29,000	--	--
Total	13,600	80,900	31,300	197,000	4,260	25,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded aggregates.

[4]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes cement and lime manufacture and flux stone.

[8]Includes other fillers or extenders.

[9]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a

ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	5,960	$27,100	$4.54
Concrete products (blocks, bricks, pipe, decorative, etc.)	188	1,270	6.78
Asphaltic concrete aggregates and other bituminous mixtures	1,990	10,400	5.23
Road base and coverings	243	1,050	4.31
Fill	230	591	2.57
Snow and ice control	5	26	5.33
Other miscellaneous uses[3]	148	1,220	8.23
Unspecified:[4]			
Reported	1,820	8,700	4.78
Estimated	3,900	17,000	4.42
Total or average	14,500	67,600	4.67

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes roofing granules.

[4]Reported and estimated production without a breakdown by end use.

TABLE 5b

ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,150	$24,100	$3.91
Plaster and gunite sands	426	2,920	6.84
Concrete products (blocks, bricks, pipe, decorative, etc.)	55	377	6.79
Asphaltic concrete aggregates and other bituminous mixtures	1,180	8,630	7.29
Road base and coverings[2]	443	1,290	2.91
Fill	948	2,160	2.28
Snow and ice control	50	138	2.74
Other miscellaneous uses[3]	108	476	4.43
Unspecified:[4]			
Reported	2,320	11,400	4.90
Estimated	3,000	14,000	4.65
Total or average	14,700	65,300	4.45

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road and other stabilization (cement and lime).

[3]Includes filtration.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a

ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	946	5,670	809	4,260	4,210	17,200
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	153	1,040	W	W
Asphaltic concrete aggregates and road base materials	331	2,180	W	W	W	W
Fill	30	87	11	124	189	380
Other miscellaneous uses[3]	40	404	338	2,480	1,710	7,870
Unspecified:[4]						
Reported	--	--	--	--	1,820	8,700
Estimated	35	160	220	1,000	3,600	16,000
Total	1,380	8,500	1,530	8,920	11,600	50,100

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes roofing granules, and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

TABLE 6b

ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	1,870	10,600	4,760	16,700
Asphaltic concrete aggregates and road base materials[4]	W	W	W	W
Fill	11	79	936	2,090
Other miscellaneous uses[5]	356	2,280	1,430	8,250
Unspecified:[6]				
Reported	472	2,420	1,850	8,950
Estimated	330	1,500	2,700	12,000
Total	3,040	16,900	11,600	48,400

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement and lime).

[5]Includes filtration and snow and ice control.

[6]Reported and estimated production without a breakdown by end use.

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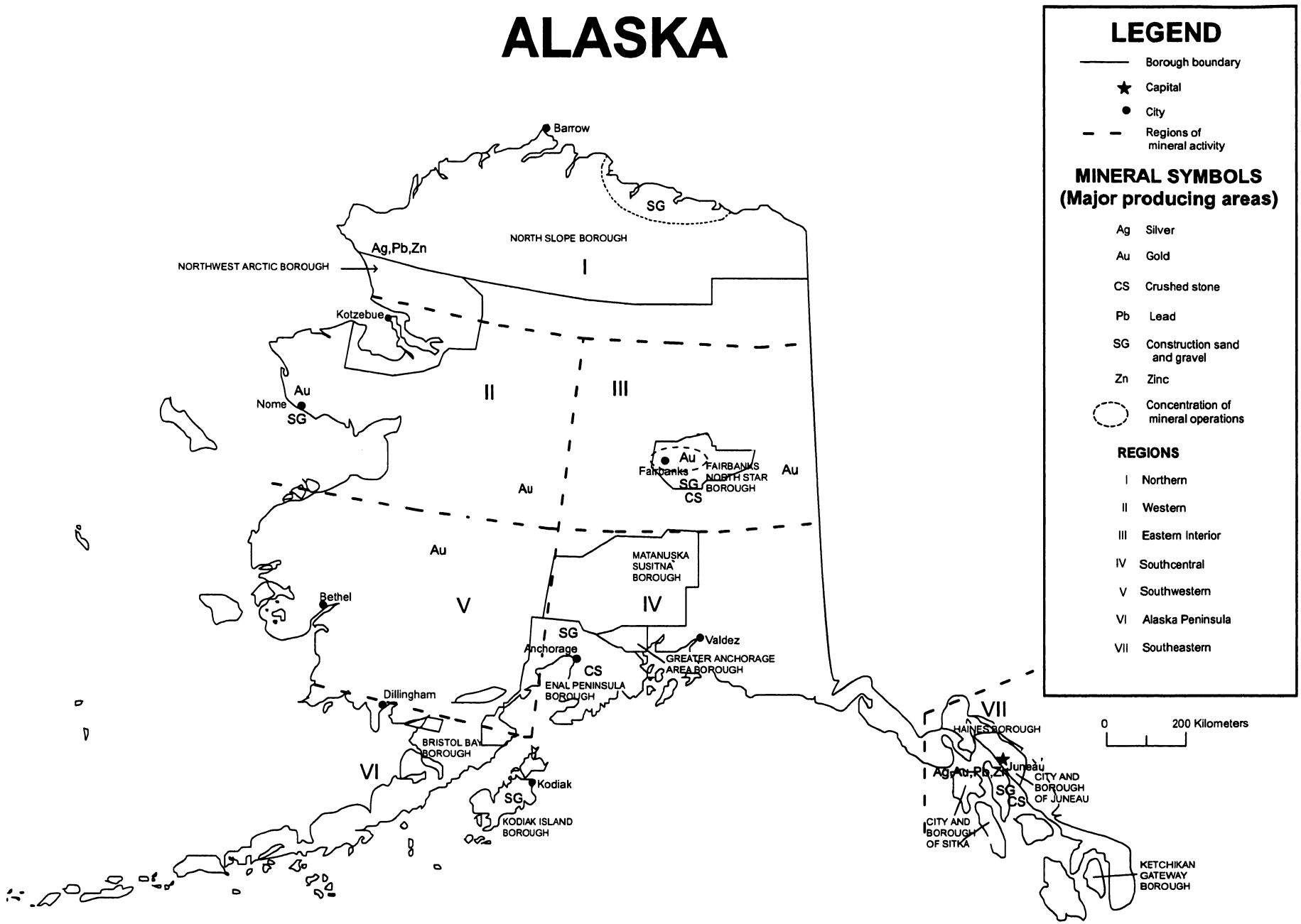
ALASKA



Source: Alaska Division of Geological and Geophysical Surveys/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF ALASKA

In 2004, Alaska's nonfuel raw mineral production was valued[1] at $1.27 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 17.6% increase from the State's total nonfuel mineral value for 2003,[2] which was up 1.9% from 2002. The State, for the third consecutive year and the fifth of the past 6 years, ranked 12th among the 50 States in total nonfuel mineral production value and accounted for nearly 3% of the U.S. total value.

During 2004, metallic minerals accounted for nearly 95% of the total value of Alaska's nonfuel mineral production. A large majority of the value was the result of zinc, lead, and silver production (descending order of value) from (1) Teck Cominco Alaska Inc.'s Red Dog Mine near Kotzebue in northwestern Alaska and the Greens Creek Mine (a joint venture of Kennecott Mineral Co. and Hecla Mining Co. in southeastern Alaska southwest of Juneau) and (2) gold production from Kinross Gold Corp.'s Fort Knox Mine near Fairbanks in east-central Alaska and from the Greens Creek Mine. Although the production levels of gold, lead, silver, and zinc were down somewhat from 2003, increases in the average unit values of each resulted in a combined increase in total value of the metals produced of more than$180 million (table 1). By far the largest increase in value was in zinc, followed by lead and silver, which each had increases in value of about one-third as much as that of zinc.

In 2003, nearly all nonfuel minerals showed increases in value. Increases in the production and values of zinc (up more than $40 million) and lead (up more than $10 million) were substantial; the value of gold increased, but production was down slightly, and the production and value of silver increased slightly. The only decrease in the value of nonfuel minerals was in construction sand and gravel, which was down nearly $38 million (table 1).

In 2004, Alaska continued to rank first in the quantities of zinc and silver produced, second in gold among 10 gold-producing States,[3] and second in lead. Production of peat in Alaska was not reported to the USGS partly because of reporting difficulties associated with the seasonal, intermittent nature of peat mining in the State. The Alaska Department of Natural Resources (ADNR), Division of Geological and Geophysical Surveys (DGGS), estimated peat production to be about 159,000 cubic meters, valued at about $2.7 million. The DGGS provided the following narrative information;[4] the data are based on DGGS surveys and estimates.

Exploration, Development, and Drilling Activities

Estimated exploration expenditures during 2004 were about $70 million, which was a substantial increase compared with expenditures of $28 million in 2003 (Szumigala and Hughes, 2005§[5]). Although most of the effort was directed at gold projects, some expenditure was noted for nickel-copper and platinum-group metals, diamond, and base metals. Exploration was conducted across Alaska, but primarily in southwestern Alaska. Fifteen exploration projects had budgets greater than $1 million. The Fairbanks mining district gold projects (Kinross Gold), the Pebble copper-gold project (Northern Dynasty Minerals Ltd.), and the Union Bay platinum-nickel-copper project (Freegold Ventures Ltd., Lonmin plc, and Pacific North West Capital Corp.) accounted for most of the exploration expenditures and drill footage. Advanced exploration projects included the Donlin Creek gold project (Calista Corp., NovaGold Resources Inc., and Placer Dome Inc.) and the Pebble copper-gold project (Northern Dynasty Minerals).

Base-metal exploration was led by NovaGold Resources' exploration of the Arctic volcanogenic massive sulfide (VMS) deposit in the Brooks Range. Platinum and associated metals exploration continued at the MAN project in the Alaska Range (Anglo American Exploration Ltd. and Nevada Star Resource Corp.) and at Union Bay in southeastern Alaska (Freegold Ventures, Lonmin, and Pacific North West Capital).

Gold remained a major exploration target, but copper-gold porphyry systems (grouped with polymetallic deposits) were the major exploration target in 2004. Base-metal exploration expenditures increased significantly from 2003 levels. Platinum-group-element exploration was unchanged.

Development investment increased to $209 million for 2004, which was a significant increase—much more than the $39 million spent in 2003. The increase was primarily owing to

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Gold figures in table 1, as reported to the USGS, may differ from estimates made by the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys (DGGS). The canvassing of gold placer mineral production was discontinued by the U.S. Bureau of Mines (the Federal agency responsible for U.S. nonfuel mineral production data collection from 1924 to 1995) in 1994. Some gold production and value data in table 1 will be further estimated by the USGS in cooperation with the DGGS. Estimates based upon data collected by the DGGS indicate the production quantity in 2002 was 17,500 kilograms (kg) valued at $174 million; in 2003, 16,400 kg (hardrock gold, 15,700 kg; placer gold, 700 kg) valued at $192 million; and in 2004, nearly 14,100 kg (hardrock gold, 13,300 kg; placer gold, 767 kg) valued at $186 million. The USGS final 2002-04 total gold production and value data for Alaska, done in collaboration with the DGGS, are published in the text of the Gold chapter in Volume I of the 2004 USGS Minerals Yearbook.

[4]Richard A. Hughes of the Alaska Department of Commerce, Community and Economic Development's Division of Community and Business Development, and David J. Szumigala, Senior Mineral Geologist with the Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys, authored the text of the State mineral industry information provided by that State agency.

[5]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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the construction at the Teck Pogo Inc. gold project by Teck Cominco Inc. and Sumitomo Metal Mining Co., which was fully permitted in mid-2004. Other significant investments were made at Fort Knox Mine, the Greens Creek Mine, the Kensington Project, and the Usibelli Coal Mine and in the sand and gravel industry.

Teck Pogo began construction at the Pogo project after the company received its final permits; an all-weather 80-kilometer (km) road was completed between Richardson Highway and the project site. A power transmission line from Golden Valley Electric Association facilities near Richardson Highway was constructed, with power due to be delivered in early 2006; mill and infrastructure facilities construction continued through 2004.

In other developments, Fairbanks Gold Mining Co. Inc. (FGMI) (a wholly owned subsidiary of Kinross Gold) acquired capital equipment and undertook advanced stripping at the Fort Knox Mine. Coeur Alaska Inc. continued development investment at Kensington Project in anticipation of a resolution of its permit appeal in early 2005. Greens Creek Mine Co. undertook tailings storage improvements and investments in underground development during the year. Usibelli Coal Mine Inc. invested in equipment and advanced stripping. The acquisition of a large cutter-head floating dredge by a Fairbanks gravel producer was a highlight for the sand and gravel industry.

Drilling was conducted during all phases of mining (exploration, development, and production) on various projects across Alaska during 2004. Preliminary drilling totals for 2004 were 100,000 meters (m) of core drilling, 7,500 m of reverse-circulation drilling, and 762 m of placer auger/churn drilling. No drilling was reported for coal operations.

Major drill programs were conducted by Northern Dynasty Minerals at the Pebble property; by Kinross Gold (FGMI) in the Fairbanks mining district, which included the Fort Knox and the True North Mines; AngloGold USA Exploration Inc. at several properties near Livengood and Pogo; Kennecott Minerals Co. at the Greens Creek Mine; the joint venture of Meridian Gold Inc. and Freegold Ventures on the Golden Summit property; NovaGold Resources at the Rock Creek, the Big Hurrah, and the Arctic properties; Teck Cominco in the Red Dog area; Kennecott Exploration Co. at the Whistler property; the joint venture of Freegold Ventures, Lonmin, and Pacific North West Capital at the Union Bay property; and the joint venture of St. Andrew Goldfields Ltd. and Mystery Creek Resources Inc. at the Nixon Fork property.

Commodity Review

The production estimates included in this report were compiled from DGGS questionnaires and telephone interviews of Alaskan Native corporations, agencies, and municipalities (Szumigala and Hughes, 2005§). Production data were collected on metals (gold, lead, silver, and zinc), industrial minerals (rock and sand and gravel), and coal and peat.

Total minerals industry employment in 2004 was estimated to be 3,048 full-time-equivalent jobs compared with 1,906 in 2003 (Szumigala and Hughes, 2005§). Most of the increase was in the exploration and development sectors. The number of jobs in the development sector is expected to increase in 2005 as more large mining projects transition into the construction phase.

Industrial Minerals

Crushed Rock and Sand and Gravel.—Production of rock and sand and gravel was up considerably compared with that of 2003. This is believed to be due to the combination of better reporting and increased production in 2004.

Metals

Gold.—FGMI operated the Fort Knox Mine and the satellite True North Mine. The company recovered about 10,500 kilograms (kg) of gold in 2004, or about 13.7% less than that of 2003. The shortfall was owing primarily to the result of lower gold ore grade. At the True North Mine, mining was suspended for a portion of the year to concentrate on stripping at Fort Knox. Production from True North was put on hold indefinitely at the end of the year. FGMI mined 17.1 million metric tons (Mt) of ore, 16 Mt from Fort Knox and 1.1 Mt from True North. Stripping volumes were 22 Mt at Fort Knox and 2.3 Mt at True North. Mill throughput amounted to 13.2 Mt at a calculated grade of 0.8 gram per metric ton (g/t) gold. Employment averaged 427.

Placer gold production reports were limited but reflected an increase in production to 873 kg in 2004. The 2003 reported production was 734 kg (Szumigala and Hughes, 2005§).

Zinc, Lead, and Silver.—The Red Dog Mine was the world's leading producer of zinc. It was 100% owned and operated by Teck Cominco under a development agreement with NANA Regional Corporation, Inc. (an Alaskan Native corporation). The mine is located in the DeLong Mountains of Alaska's Brooks Range; this remote site is approximately 144 km north of Kotzebue and 88 km from the Chukchi Sea.

Red Dog dominated Alaska's mineral production value and accounted for more than 50% of the annual value of Alaska's mineral industry. The mill processed 2.95 Mt at an average grade of 22% zinc. Sulfide concentrates contained 554,000 metric tons (t) of zinc, 117,000 t of lead, and an estimated 225,000 kg of silver. Red Dog reported an operating profit of $207 million compared with $42 million for 2003 (2003 numbers have been restated owing to new accounting standards by Teck Cominco). The improved results were attributed to higher average zinc prices. The domestic producer price for zinc was about $0.53 per pound in 2004 compared with $0.41 per pound in 2003 (Plachy, 2005).

In the southeastern region of Alaska southwest of Juneau, the Greens Creek Mine produced a silver-gold doré and sulfide concentrates that contained zinc, lead, and minor amounts of copper. The mine achieved another record year by milling 731,000 t of ore, which was a 3% increase compared with 2003. The average silver head grade was 675 g/t. Metal production totaled 302,000 kg of silver, 2,700 kg of gold, 62,700 t of zinc, and 19,800 t of lead.

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The DGGS conducted geologic mapping and geochemical sampling near the Big Hurrah area and in the Council area as part of an integrated program to follow up on the airborne geophysical survey results released by the DGGS in 2003. The DGGS also contracted for and worked on a 54,000-hectare (ha) airborne magnetic and electromagnetic geophysical survey in the southern Goodpaster region of the Big Delta Quadrangle. The data from this survey will be released in early 2005.

The DGGS released new trace-element geochemical data and whole-rock geochemical data for surface rock samples that were collected over 34,000 ha of the central Livengood Quadrangle in 2001 and 2003. One highly anomalous sample from a known prospect yielded slightly more than 34 g/t gold. DGGS also released new 1:50,000-scale geologic maps of the Livengood area as part of an integrated program to follow up on the airborne geophysical survey results released by the agency in 1999.

The DGGS also released a new bedrock geologic map of the Salcha River-Pogo area, which is located in the central Big Delta Quadrangle of Alaska. This 1:63,360-scale map, which covers approximately 113,000 ha within parts of the Fairbanks and the Goodpaster mining districts, was based on airborne geophysical survey (helicopter-based aeromagnetic, radiometric, and electromagnetic data) released by the DGGS in 2000 as part of the State-funded Alaska Airborne Geophysical/Geological Mineral Inventory Program. The map also contains information derived from fieldwork that was conducted during the summers of 2000 through 2002 by mineral-resource personnel from the DGGS and the University of Alaska–Fairbanks.

The ADNR released "LAS Mapper," which is an Internet mapping service. This mapping tool allows access to the Land Administration System (LAS) spatial and tabular data via an interactive map-based interface. The ADNR adjudicators had maintained a case file-based system within LAS for nearly 20 years. The LAS Mapper uses Internet mapping technology that enables the user to view the database of permits, leases, land sales, and other land-status information used to create Land Status Plats.

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The DGGS, the U.S. Bureau of Land Management (BLM), and the USGS continued a number of cooperative projects under the Minerals Data and Information Rescue in Alaska (MDIRA) program. The DGGS continued work on the Alaska Resource Database Files (ARDF) project. Other DGGS-managed, MDIRA-funded projects included compilations of the Alaskan bedrock and surficial geology map index project and DGGS lithochemical data and the building of a comprehensive database system at the agency. Other MDIRA-funded projects were in progress at other divisions of the ADNR, at the University of Alaska–Fairbanks, and with private contractors.

In 2004, the BLM conducted the final year of an extensive multiyear field program in the Delta River mining district of eastern and southcentral Alaska. Lode, placer, industrial, and coal sites were visited, geochemical samples were collected, and the analytical results were published. Final results from this work were expected to be published in 2005. Fieldwork during the 5-week field season at the Aniak mining district study focused on property examinations and sample collection in the central one-third of the district. BLM geologists succeeded in visiting 86 mineral occurrences in the central part of the study area and collected 287 samples. Work began around the historic mining town of Flat and proceeded south through Granite Creek and Julian Creek areas to the vicinity of Donlin Creek. The district evaluation then concentrated on mercury deposits in the Red Devil area. The gold and mercury occurrences in the west-central Sleetmute Quadrangle (Gold Run, Kolmakof, Mountain Top, and Murray Gulch) were then evaluated. A small crew was able to visit the Forty-Seven Creek and the Taylor Mountain areas, which extended the fieldwork into the southern district boundary. Summaries of this fieldwork and the analytical results were published in early 2005.

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Alaska House Bill 556 by the House State Affairs committee authorized the Alaska Industrial Development and Export Authority to issue up to $20 million in bond debt for facilities to support the development of the Kensington Mine near Juneau. These tax-exempt bonds will help reduce construction costs of a port development project at Slate Creek Cove and Cascade Point on Lynn Canal.

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Alaska Senate Bill 305 asserts the State's title to submerged lands by giving general notice that the State of Alaska claims title to navigable waters in the State; providing authority for the State to identify, in accordance with applicable Federal and State laws, which water bodies are navigable and which are not; and requiring the Commissioner of Natural Resources to notify Native corporations that they can obtain nonsubmerged acreage for submerged lands they may have received under the Alaska Native Claims Settlement Act.

The State of Alaska filed 13 applications that covered 31 water bodies for Recordable Disclaimers of Interest with BLM. A Disclaimer of Interest is a document issued by the Federal Government that confirms that it does not own Federal certain lands. In this case, the Federal Government agrees that it has no interest in the beds of certain navigable rivers and lakes. In 2004, the BLM issued a disclaimer for portions of the Black River and four of its tributaries—the Klutina River, Klutina Lake, Kvichak Lake, and Lake Iliamna. These are the first three such disclaimers to be issued in the United States.

In June 2004, the State reviewed and accepted TransCanada Corp.'s application under the Stranded Gas Development Act, which made it the third such application to be negotiated with companies interested in building a pipeline to move Alaska's North Slope gas to market. Calgary-based pipeline operator TransCanada and its wholly owned subsidiary Alaskan Northwest Natural Gas Transportation Co. have proposed building a 19-centimeter-diameter, steel pipeline from the North Slope to the Alaska-Yukon Territory border where 4.5 billion cubic feet per day of gas would feed into the Canadian portion of the project for distribution across North America. In addition to TransCanada, the State was actively negotiating with two other sponsor groups, which included the three major North Slope producers (BP, ConocoPhillips, and Exxon Mobil Corp.), and Enbridge Inc. (another Canadian pipeline company).

The ADNR revised the financial assurance requirements for large mine operators to allow sinking trust funds to be established and to require total financial assurance in the amount needed to reclaim a large lode mine site, rather than the previous $304 per hectare or $750 per acre rule, an amount that still holds for placer mines.

More than 2.8 million ha of Alaska burned during 2004. Wildfires threatened communities and mining operations across the State and particularly in the Eastern Interior region. The National Guard was mobilized to assist Federal and State firefighters. No serious accidents resulted from the fires, but several mining projects were partially to completely burned. As a result, all fire policies were placed under review.

Two employees from Taiga Mining Co. Inc. were awarded the 2004 annual State reclamation award by the ADNR in recognition of the company's excellent reclamation work on Bear Creek and its tributaries, Dry and Ida Creeks. The BLM recommended Taiga on the basis of Taiga's mining and reclamation plans that have created stream valleys with adequate floodplain widths and channel locations such that streams were reestablished with uniform slopes and appropriate widths and depths. These efforts reduced the stream headcutting, lateral migration, and subsequent sedimentation typical of new channels. The establishment of riparian vegetation within the active floodplain of Ida Creek was indicative of this channel's stability. Taiga had been mining in the Bear Creek Watershed for more than a decade. Approximately 81 ha had been mined and reclaimed. Bear Creek is located within the BLM's Hogatza River Area of Critical Environmental Concern, which a special management area created for its exceptional summer-run chum salmon spawning habitat.

Reference Cited

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Szumigala, D.J., and Hughes, R.A., 2005, Alaska's mineral industry 2004—Special Report 59, Alaska Division of Geological and Geophysical Surveys, 75 p., accessed November 10, 2005, at URL http://www.dggs.dnr.state.ak.us/scan1/sr/text/SR59.PDF.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALASKA[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Gemstones		NA	12	NA	12	NA	12
Gold[3]	kilograms	16,900	170,000	W	W	W	W
Sand and gravel, construction		16,300	93,400	9,980	55,700	9,430	51,600
Silver[3]	kilograms	559,000	83,100	W	W	W	W
Stone, crushed[4]		2,810 r	15,200 r	2,640	15,300	2,230	13,900
Combined values of lead, stone [crushed dolomite, granite, limestone, shell (2002), crushed granite and shell (2003-04)], zinc, and values indicated by symbol W		XX	695,000	XX	1,010,000	XX	1,200,000
Total		XX	1,060,000 r	XX	1,080,000	XX	1,270,000

pPreliminary. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ALASKA: CRUSHED STONE SOLD OR USED, BY KIND[1,2]

Kind	2002				2003			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone-dolomite	1	W	W	W	--	--	--	--
Granite	2	W	W	$7.41 r	2	W	W	$7.25
Traprock	3	(3)	(3)	4.30	4	(3)	(3)	6.27
Shell	1	W	W	3.00	1	W	W	4.28
Miscellaneous stone	7	(3)	(3)	5.49 r	7	(3)	(3)	5.78
Total or average	XX	2,810 r	$15,200 r	5.42	XX	2,640	$15,300	5.81

rRevised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

[3]Withheld to avoid disclosing company proprietary data; included in "Total."

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TABLE 3
ALASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1, 2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 ½ inch):			
Riprap and jetty stone	W	W	$9.23
Filter stone	W	W	11.82
Total or average	15	$163	10.87
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.87
Railroad ballast	W	W	7.72
Other graded coarse aggregate	8	73	9.13
Total or average	15	128	8.53
Coarse and fine aggregates:			
Graded road base or subbase	W	W	7.72
Unpaved road surfacing	W	W	10.70
Crusher run (select material or fill)	W	W	14.33
Other coarse and fine aggregates	13	98	7.54
Total or average	73	664	9.10
Unspecified:[3]			
Reported	2,430	13,800	5.68
Estimated	100	560	5.41
Total or average	2,540	14,400	5.67
Grand total or average	2,640	15,300	5.81

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Data derived, in part, from information obtained from the Alaska Department Natural Resoures, Division of Geological and Geophysical Surveys.
[3]Reported and estimated production without a breakdown by end use.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,750	$9,840	$5.65
Asphaltic concrete aggregates and other bituminous mixtures	682	6,410	9.40
Road base and coverings	1,210	6,940	5.75
Fill	2,610	10,200	3.91
Snow and ice control	101	1,010	9.99
Other miscellaneous uses[2]	9	92	9.75
Unspecified:[3]			
Reported	2,470	14,400	5.84
Estimated	1,200	6,700	5.86
Total or average	9,980	55,700	5.58

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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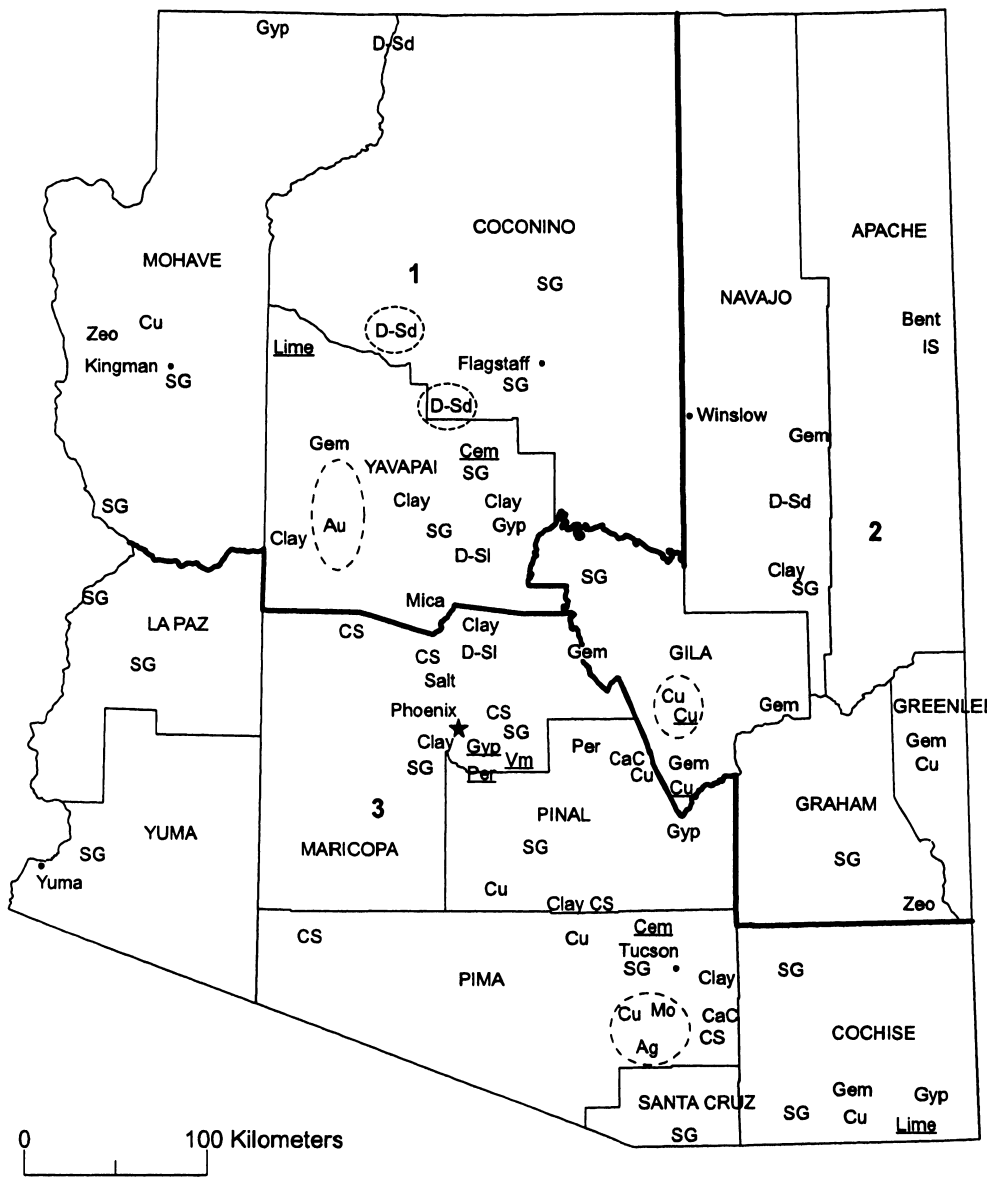
ARIZONA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite
CaC	Calcium carbonate
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-Sd	Dimension sandstone
D-Sl	Dimension slate
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
Mica	Mica
Mo	Molybdenum
Per	Perlite
Per	Perlite plant
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite plant
Zeo	Zeolites
(dashed)	Concentration of mineral operations

Source: Arizona Department of Mines and Mineral Resources/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF ARIZONA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 2004, Arizona's nonfuel raw mineral production was valued[1] at $3.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of nearly 53% compared with $2.18 billion in 2003[2] and followed an 11.8% increase from 2002 to 2003. Arizona accounted for nearly 7.3% of the total nonfuel mineral production value in the United States and ranked third in 2004 among the 50 States for the fifth time in the past 7 years; the State had ranked fourth in 2003, fifth in 2002, and first from 1995 through 1997.

Arizona continued to be the Nation's leading copper-producing State in 2004 and accounted for more than 62% of total U.S. copper mine production and value. Copper was the State's foremost nonfuel mineral produced; it accounted for about 64% of Arizona's total nonfuel mineral production value followed by construction sand and gravel (with more than 11% of the State's total value), molybdenum concentrates, portland cement, crushed stone (with about 2% of the value), and lime.

Arizona's substantial increases in value in 2004 and 2003 resulted mainly from the increased values of copper and molybdenum and smaller yet very significant increases in construction sand and gravel, portland cement, and crushed stone (table 1). Although copper production decreased by about 2.5% in 2004, its value increased by more than 53% because of significantly higher average copper prices. Molybdenum concentrate production rose by more than 2%, and its total production value was more than triple that of 2003 as the significant growth in molybdenum concentrate prices that began December 2002 continued on throughout 2003 and 2004. For example, the time-average price of molybdic oxide rose from $8.27 per kilogram in 2002 to $11.75 per kilogram in 2003 to $36.73 per kilogram in 2004 and reached $68.89 in December 2004. Molybdenum concentrate prices remained high and continued to increase more gradually during the early months of 2005. (Prices were reported in Platts Metals Week in dollars per kilogram of contained molybdenum.)

In 2003, copper led the State's rise in nonfuel mineral production value with an increase of $113 million followed by molybdenum concentrates, which was up by more than $50 million; construction sand and gravel, up by $46 million; portland cement, up by more than $20 million; lime, up by about $7 million; and dimension stone, up by nearly $2 million. Production increased for the latter five commodities, but copper production was down slightly. The largest decreases in total value for each mineral commodity were in crushed stone, industrial sand and gravel, and salt, each of which were down by about $2 million. All other increases and decreases in value were by about $1 million or less and did not significantly affect the State's overall nonfuel mineral production value in 2003 (table 1).

In 2004, Arizona continued to lead the Nation in the quantities of copper and molybdenum concentrates produced and remained second in gemstones (based on value) and third in perlite. The State rose in rank in three nonfuel mineral commodities: to 3d from 4th in construction sand and gravel, to 4th from 6th in zeolites, and to 6th from 7th in dimension stone; and it decreased in three: to 2d from 1st in pumice and pumicite, to 7th from 5th in silver and to 10th from 9th of 10 gold-producing States. Additionally, Arizona continued to be a significant producer of, in descending order of value, portland cement, lime, and masonry cement.

The Arizona Department of Mines and Mineral Resources[3] (ADMMR) provided the following narrative information. Data presented in ADMMR reports may differ somewhat from data reported by the USGS in table 1.

Exploration and Development Activities

Copper.—Early in 2004, Rio Tinto plc announced that it had earned a 55% interest in the joint-venture Resolution Copper Co. project near Superior by expending $25 million on exploration drilling. BHP-Billiton retained a 45% stake in the joint-venture company. Although the deep mineralization could make the property difficult to develop, it may also prove to be one of the richest and largest copper discoveries in North America. On May 1, Rio Tinto, through the joint venture, officially took over the west plant site, which included the old Magma mill and smelter plant site. The company spent $2 million on restoration and cleanup. The focus of the work was to improve erosion resistance on the dumps and spillways and to close of some of the surface openings to old underground mines. Other activities underway included a hydrological investigation of the site and land acquisition for possible exchange. An estimated $200 million might be spent on the project prior to any production decision. Preliminary plans were to develop the deposit by block caving. Drilling to gather geotechnical

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3] Nyal J. Niemuth, Mining Engineer, authored the text of the State mineral industry information provided by the Arizona Department of Mines and MineralResources

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information for mine development, shaft sinking, and further definition of the deposit resumed in early 2005.

Cambior Inc. announced that a study to examine the possibilities for a joint-venture operation of the Carlota and the Pinto Valley facilities was completed. BHP Copper was apparently not interested in a joint venture, but may lease or sell some facilities. The 95-million-metric-ton (Mt) copper oxide deposit remained fully permitted and could be developed.

St. Genevieve Resources acquired the Emerald Isle and the Zonia properties from Arimetco International Inc. via bankruptcy court. This company planned to return Emerald Isle to production quickly. The copper deposit contains about 900,000 metric tons (t) of ore at a grade of 0.75% copper, and a solvent/extraction electrowinning plant is onsite.

General Minerals Corp. expanded its holdings and defined a geophysical anomaly 5 kilometers northwest of Phelps Dodge Corp.'s Dos Pobres deposit in the Safford district. The company also conducted geologic and geophysical work to define a copper target at the Monitor Mine northeast of the Ray Mine. In early 2005, General Minerals announced they had optioned the property to Teck Cominco Ltd.

The Helvetia/Rosemont property, which contained an undeveloped copper deposit, was sold by ASARCO Incorporated (Asarco) to Rosemont Ranch LLC and other parties for $4.5 million. In January 2005, the Rosemont Ranch partners offered the property to Pima County for purchase as open space for $11.5 million and noted they had received an offer from mining group Augusta Capital Corp. for a similar amount. No sale was announced.

Gold.—American Bonanza Gold Corp. executed the most significant gold program in Arizona during 2004. At yearend, the company's 40,000-meter (m) drilling program at Copperstone in La Paz County was 50% finished; six rigs were being used to drill from the surface and underground (American Bonanza Gold Corp., 2004§[4]). The high-grade D zone was drilled from an underground drill bay. Additional targets included the Footwall target, which is about 120 m below the main Copperstone Fault in the central part of the open pit and the High Wall area, which is located north of the open pit to the southeast of the D zone and the C zone. Data from approximately 100 holes have been released with assay results that include many with high-grade intercepts. Announcement of a minable reserve and a production decision was expected in 2005. Bonanza also initiated metallurgical and environmental baseline programs to support a feasibility study and permitting of the project.

During the first quarter of 2004, Bema Gold Corp. announced a write-down of $8.5 million in the carrying value of the Yarnell gold property in Yavapai County, which was reported to contain up to 10 Mt of mineralization (Bema Gold Corp., 2004§). On April 30, 2004, Bema entered into a letter of intent to sell the Yarnell gold property for cash and a net smelter royalty of approximately $2.2 million. During the fourth quarter, another company, Gold Spring, reported that it was evaluating the property.

Among other gold exploration projects in Arizona, five companies announced drilling activities. These included Capital Hill at the Mexican Hat working on the Victoria and 16 zones in Cochise County; Galaxy Minerals Inc. at the Yellow Jacket property in Santa Cruz county; Patriot Gold Corp., which put in 30 holes at the Moss Mine and planned more drilling; and Abington Ventures Inc. and Hellix Ventures Inc. at the Oakland and adjacent Verdstone gold mines.

Commodity Review

Industrial Minerals

Growth in the production and value of industrial minerals by Arizona producers continued. The Phoenix metropolitan area surpassed Atlanta to become the largest new market in the United States. A number of sales included the purchase by Western Power and Equipment Corp. of Arizona Pacific Materials LLC, which produced specialty basalt aggregate at the Queen Creek quarry in the southeastern corner of metropolitan Phoenix and cinders from the Apple pit near Flagstaff. Kildare Enterprises LLC purchased all American Sandstone's flagstone operations near Drake. Cemex S.A. purchased the RMC Group, which was the world's leading ready-mixed concrete maker, for $4.15 billion to expand its markets in Europe and in the United States. The purchase would have the opposite effect in one local market, Tucson, because the U.S. Federal Trade Commission was expected to require Cemex to divest the former holdings of RMC in Tucson during 2005 to reduce Cemex's market share. Some of the large publicly traded companies (for example, Rinker Materials Corp.) reported that they were benefiting from the construction boom in Arizona and the consequent increased prices for sand and gravel and cement block.

Metals

Copper.—The average U.S. producer cathode price for copper rose by 57% to $1.34 per pound in 2004 from $0.85 per pound in 2003, which accounted for the increase in the value of Arizona's copper production (table 1; Edelstein, 2005, p. 8).

Asarco's three operating mines produced about 154,000 t in 2004. Production fell by 14,000 t at the Ray Mine, increased slightly at the Mission Mine, and remained stable at the Silver Bell Mine. In April 2004, Asarco increased stripping to take advantage of the higher revenues and to achieve a long-term cash break-even point below $.75 per pound of copper. As a result, waste removal in 2004 increased by about 65% compared with that of 2003, while ore mined declined slightly. Increased costs were associated with the increased tonnage moved and with upgrading equipment maintenance to raise equipment availability levels to the industry standard levels. After Asarco completed 80% of its stripping objective at the Ray Mine, the mine returned to normal operations during the first quarter of 2005. The Mission Mine completed more than one-half of its stripping goal and was forecast to return to normal operations in mid-2005. Both mines were projected to achieve production increases of 40%.

[4]References that include a section mark (§) are found in the Internet References Cited section.

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Government Programs, Activities, Reclamation Awards

The DGGS conducted geologic mapping and geochemical sampling near the Big Hurrah area and in the Council area as part of an integrated program to follow up on the airborne geophysical survey results released by the DGGS in 2003. The DGGS also contracted for and worked on a 54,000-hectare (ha) airborne magnetic and electromagnetic geophysical survey in the southern Goodpaster region of the Big Delta Quadrangle. The data from this survey will be released in early 2005.

The DGGS released new trace-element geochemical data and whole-rock geochemical data for surface rock samples that were collected over 34,000 ha of the central Livengood Quadrangle in 2001 and 2003. One highly anomalous sample from a known prospect yielded slightly more than 34 g/t gold. DGGS also released new 1:50,000-scale geologic maps of the Livengood area as part of an integrated program to follow up on the airborne geophysical survey results released by the agency in 1999.

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Alaska Senate Bill 305 asserts the State's title to submerged lands by giving general notice that the State of Alaska claims title to navigable waters in the State; providing authority for the State to identify, in accordance with applicable Federal and State laws, which water bodies are navigable and which are not; and requiring the Commissioner of Natural Resources to notify Native corporations that they can obtain nonsubmerged acreage for submerged lands they may have received under the Alaska Native Claims Settlement Act.

The State of Alaska filed 13 applications that covered 31 water bodies for Recordable Disclaimers of Interest with BLM. A Disclaimer of Interest is a document issued by the Federal Government that confirms that it does not own Federal certain lands. In this case, the Federal Government agrees that it has no interest in the beds of certain navigable rivers and lakes. In 2004, the BLM issued a disclaimer for portions of the Black River and four of its tributaries—the Klutina River, Klutina Lake, Kvichak Lake, and Lake Iliamna. These are the first three such disclaimers to be issued in the United States.

In June 2004, the State reviewed and accepted TransCanada Corp.'s application under the Stranded Gas Development Act, which made it the third such application to be negotiated with companies interested in building a pipeline to move Alaska's North Slope gas to market. Calgary-based pipeline operator TransCanada and its wholly owned subsidiary Alaskan Northwest Natural Gas Transportation Co. have proposed building a 19-centimeter-diameter, steel pipeline from the North Slope to the Alaska-Yukon Territory border where 4.5 billion cubic feet per day of gas would feed into the Canadian portion of the project for distribution across North America. In addition to TransCanada, the State was actively negotiating with two other sponsor groups, which included the three major North Slope producers (BP, ConocoPhillips, and Exxon Mobil Corp.), and Enbridge Inc. (another Canadian pipeline company).

The ADNR revised the financial assurance requirements for large mine operators to allow sinking trust funds to be established and to require total financial assurance in the amount needed to reclaim a large lode mine site, rather than the previous $304 per hectare or $750 per acre rule, an amount that still holds for placer mines.

More than 2.8 million ha of Alaska burned during 2004. Wildfires threatened communities and mining operations across the State and particularly in the Eastern Interior region. The National Guard was mobilized to assist Federal and State firefighters. No serious accidents resulted from the fires, but several mining projects were partially to completely burned. As a result, all fire policies were placed under review.

Two employees from Taiga Mining Co. Inc. were awarded the 2004 annual State reclamation award by the ADNR in recognition of the company's excellent reclamation work on Bear Creek and its tributaries, Dry and Ida Creeks. The BLM recommended Taiga on the basis of Taiga's mining and reclamation plans that have created stream valleys with adequate floodplain widths and channel locations such that streams were reestablished with uniform slopes and appropriate widths and depths. These efforts reduced the stream headcutting, lateral migration, and subsequent sedimentation typical of new channels. The establishment of riparian vegetation within the active floodplain of Ida Creek was indicative of this channel's stability. Taiga had been mining in the Bear Creek Watershed for more than a decade. Approximately 81 ha had been mined and reclaimed. Bear Creek is located within the BLM's Hogatza River Area of Critical Environmental Concern, which a special management area created for its exceptional summer-run chum salmon spawning habitat.

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Internet Reference Cited

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALASKA[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Gemstones		NA	12	NA	12	NA	12
Gold[3]	kilograms	16,900	170,000	W	W	W	W
Sand and gravel, construction		16,300	93,400	9,980	55,700	9,430	51,600
Silver[3]	kilograms	559,000	83,100	W	W	W	W
Stone, crushed[4]		2,810 r	15,200 r	2,640	15,300	2,230	13,900
Combined values of lead, stone [crushed dolomite, granite, limestone, shell (2002), crushed granite and shell (2003-04)], zinc, and values indicated by symbol W		XX	695,000	XX	1,010,000	XX	1,200,000
Total		XX	1,060,000 r	XX	1,080,000	XX	1,270,000

pPreliminary. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ALASKA: CRUSHED STONE SOLD OR USED, BY KIND[1,2]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value
Limestone-dolomite	1	W	W	W	--	--	--	--
Granite	2	W	W	$7.41 r	2	W	W	$7.25
Traprock	3	(3)	(3)	4.30	4	(3)	(3)	6.27
Shell	1	W	W	3.00	1	W	W	4.28
Miscellaneous stone	7	(3)	(3)	5.49 r	7	(3)	(3)	5.78
Total or average	XX	2,810 r	$15,200 r	5.42	XX	2,640	$15,300	5.81

rRevised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

[3]Withheld to avoid disclosing company proprietary data; included in "Total."

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TABLE 3
ALASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1, 2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 ½ inch):			
Riprap and jetty stone	W	W	$9.23
Filter stone	W	W	11.82
Total or average	15	$163	10.87
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.87
Railroad ballast	W	W	7.72
Other graded coarse aggregate	8	73	9.13
Total or average	15	128	8.53
Coarse and fine aggregates:			
Graded road base or subbase	W	W	7.72
Unpaved road surfacing	W	W	10.70
Crusher run (select material or fill)	W	W	14.33
Other coarse and fine aggregates	13	98	7.54
Total or average	73	664	9.10
Unspecified:[3]			
Reported	2,430	13,800	5.68
Estimated	100	560	5.41
Total or average	2,540	14,400	5.67
Grand total or average	2,640	15,300	5.81

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Data derived, in part, from information obtained from the Alaska Department Natural Resoures, Division of Geological and Geophysical Surveys.
[3]Reported and estimated production without a breakdown by end use.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,750	$9,840	$5.65
Asphaltic concrete aggregates and other bituminous mixtures	682	6,410	9.40
Road base and coverings	1,210	6,940	5.75
Fill	2,610	10,200	3.91
Snow and ice control	101	1,010	9.99
Other miscellaneous uses[2]	9	92	9.75
Unspecified:[3]			
Reported	2,470	14,400	5.84
Estimated	1,200	6,700	5.86
Total or average	9,980	55,700	5.58

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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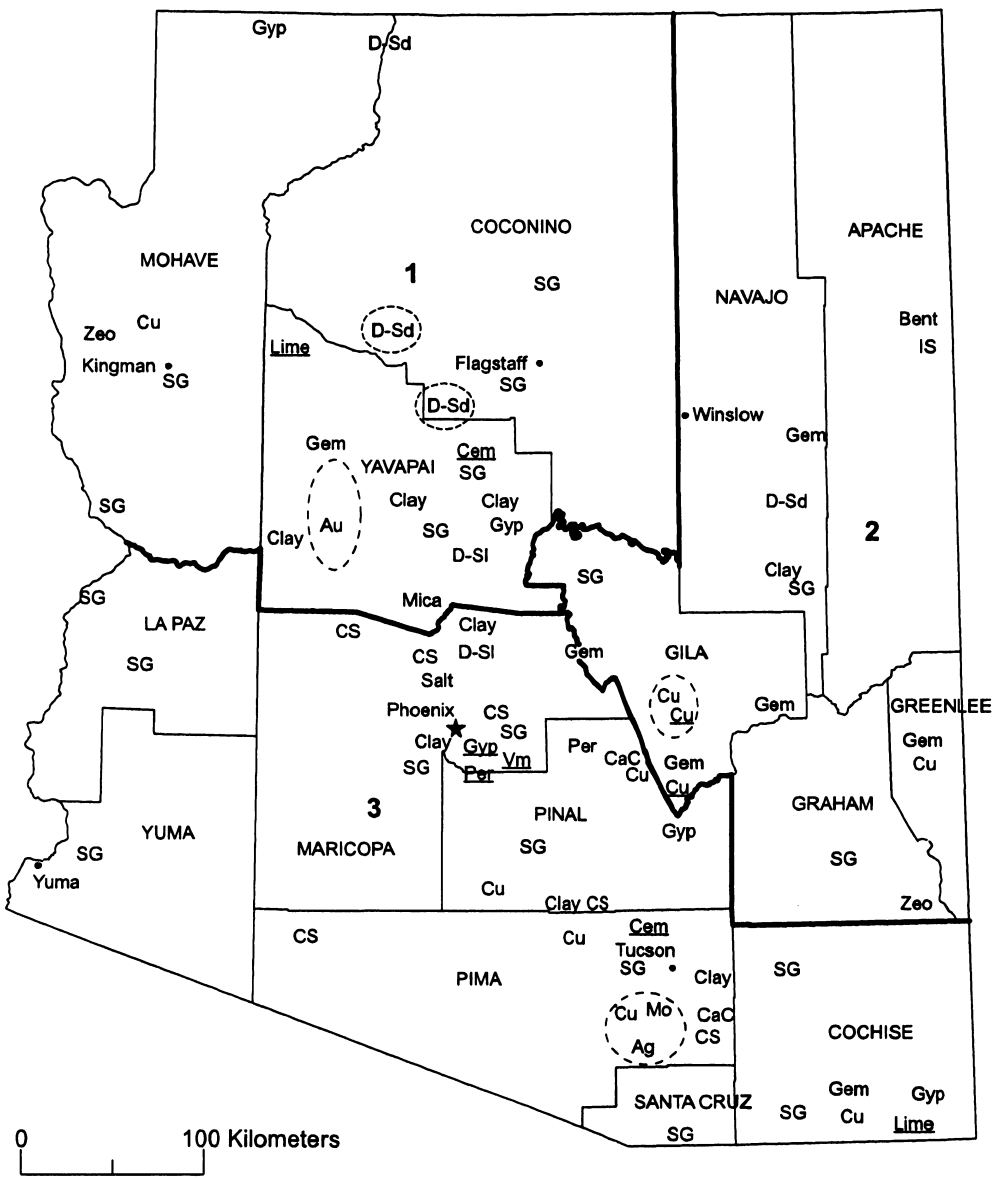
ARIZONA



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite
CaC	Calcium carbonate
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-Sd	Dimension sandstone
D-Sl	Dimension slate
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
Mica	Mica
Mo	Molybdenum
Per	Perlite
Per	Perlite plant
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite plant
Zeo	Zeolites
(dashed)	Concentration of mineral operations

Source: Arizona Department of Mines and Mineral Resources/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF ARIZONA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 2004, Arizona's nonfuel raw mineral production was valued[1] at $3.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of nearly 53% compared with $2.18 billion in 2003[2] and followed an 11.8% increase from 2002 to 2003. Arizona accounted for nearly 7.3% of the total nonfuel mineral production value in the United States and ranked third in 2004 among the 50 States for the fifth time in the past 7 years; the State had ranked fourth in 2003, fifth in 2002, and first from 1995 through 1997.

Arizona continued to be the Nation's leading copper-producing State in 2004 and accounted for more than 62% of total U.S. copper mine production and value. Copper was the State's foremost nonfuel mineral produced; it accounted for about 64% of Arizona's total nonfuel mineral production value followed by construction sand and gravel (with more than 11% of the State's total value), molybdenum concentrates, portland cement, crushed stone (with about 2% of the value), and lime.

Arizona's substantial increases in value in 2004 and 2003 resulted mainly from the increased values of copper and molybdenum and smaller yet very significant increases in construction sand and gravel, portland cement, and crushed stone (table 1). Although copper production decreased by about 2.5% in 2004, its value increased by more than 53% because of significantly higher average copper prices. Molybdenum concentrate production rose by more than 2%, and its total production value was more than triple that of 2003 as the significant growth in molybdenum concentrate prices that began December 2002 continued on throughout 2003 and 2004. For example, the time-average price of molybdic oxide rose from $8.27 per kilogram in 2002 to $11.75 per kilogram in 2003 to $36.73 per kilogram in 2004 and reached $68.89 in December 2004. Molybdenum concentrate prices remained high and continued to increase more gradually during the early months of 2005. (Prices were reported in Platts Metals Week in dollars per kilogram of contained molybdenum.)

In 2003, copper led the State's rise in nonfuel mineral production value with an increase of $113 million followed by molybdenum concentrates, which was up by more than $50 million; construction sand and gravel, up by $46 million; portland cement, up by more than $20 million; lime, up by about $7 million; and dimension stone, up by nearly $2 million. Production increased for the latter five commodities, but copper production was down slightly. The largest decreases in total value for each mineral commodity were in crushed stone, industrial sand and gravel, and salt, each of which were down by about $2 million. All other increases and decreases in value were by about $1 million or less and did not significantly affect the State's overall nonfuel mineral production value in 2003 (table 1).

In 2004, Arizona continued to lead the Nation in the quantities of copper and molybdenum concentrates produced and remained second in gemstones (based on value) and third in perlite. The State rose in rank in three nonfuel mineral commodities: to 3d from 4th in construction sand and gravel, to 4th from 6th in zeolites, and to 6th from 7th in dimension stone; and it decreased in three: to 2d from 1st in pumice and pumicite, to 7th from 5th in silver and to 10th from 9th of 10 gold-producing States. Additionally, Arizona continued to be a significant producer of, in descending order of value, portland cement, lime, and masonry cement.

The Arizona Department of Mines and Mineral Resources[3] (ADMMR) provided the following narrative information. Data presented in ADMMR reports may differ somewhat from data reported by the USGS in table 1.

Exploration and Development Activities

Copper.—Early in 2004, Rio Tinto plc announced that it had earned a 55% interest in the joint-venture Resolution Copper Co. project near Superior by expending $25 million on exploration drilling. BHP-Billiton retained a 45% stake in the joint-venture company. Although the deep mineralization could make the property difficult to develop, it may also prove to be one of the richest and largest copper discoveries in North America. On May 1, Rio Tinto, through the joint venture, officially took over the west plant site, which included the old Magma mill and smelter plant site. The company spent $2 million on restoration and cleanup. The focus of the work was to improve erosion resistance on the dumps and spillways and to close of some of the surface openings to old underground mines. Other activities underway included a hydrological investigation of the site and land acquisition for possible exchange. An estimated $200 million might be spent on the project prior to any production decision. Preliminary plans were to develop the deposit by block caving. Drilling to gather geotechnical

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3] Nyal J. Niemuth, Mining Engineer, authored the text of the State mineral industry information provided by the Arizona Department of Mines and MineralResources

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information for mine development, shaft sinking, and further definition of the deposit resumed in early 2005.

Cambior Inc. announced that a study to examine the possibilities for a joint-venture operation of the Carlota and the Pinto Valley facilities was completed. BHP Copper was apparently not interested in a joint venture, but may lease or sell some facilities. The 95-million-metric-ton (Mt) copper oxide deposit remained fully permitted and could be developed.

St. Genevieve Resources acquired the Emerald Isle and the Zonia properties from Arimetco International Inc. via bankruptcy court. This company planned to return Emerald Isle to production quickly. The copper deposit contains about 900,000 metric tons (t) of ore at a grade of 0.75% copper, and a solvent/extraction electrowinning plant is onsite.

General Minerals Corp. expanded its holdings and defined a geophysical anomaly 5 kilometers northwest of Phelps Dodge Corp.'s Dos Pobres deposit in the Safford district. The company also conducted geologic and geophysical work to define a copper target at the Monitor Mine northeast of the Ray Mine. In early 2005, General Minerals announced they had optioned the property to Teck Cominco Ltd.

The Helvetia/Rosemont property, which contained an undeveloped copper deposit, was sold by ASARCO Incorporated (Asarco) to Rosemont Ranch LLC and other parties for $4.5 million. In January 2005, the Rosemont Ranch partners offered the property to Pima County for purchase as open space for $11.5 million and noted they had received an offer from mining group Augusta Capital Corp. for a similar amount. No sale was announced.

Gold.—American Bonanza Gold Corp. executed the most significant gold program in Arizona during 2004. At yearend, the company's 40,000-meter (m) drilling program at Copperstone in La Paz County was 50% finished; six rigs were being used to drill from the surface and underground (American Bonanza Gold Corp., 2004§[4]). The high-grade D zone was drilled from an underground drill bay. Additional targets included the Footwall target, which is about 120 m below the main Copperstone Fault in the central part of the open pit and the High Wall area, which is located north of the open pit to the southeast of the D zone and the C zone. Data from approximately 100 holes have been released with assay results that include many with high-grade intercepts. Announcement of a minable reserve and a production decision was expected in 2005. Bonanza also initiated metallurgical and environmental baseline programs to support a feasibility study and permitting of the project.

During the first quarter of 2004, Bema Gold Corp. announced a write-down of $8.5 million in the carrying value of the Yarnell gold property in Yavapai County, which was reported to contain up to 10 Mt of mineralization (Bema Gold Corp., 2004§). On April 30, 2004, Bema entered into a letter of intent to sell the Yarnell gold property for cash and a net smelter royalty of approximately $2.2 million. During the fourth quarter, another company, Gold Spring, reported that it was evaluating the property.

Among other gold exploration projects in Arizona, five companies announced drilling activities. These included Capital Hill at the Mexican Hat working on the Victoria and 16 zones in Cochise County; Galaxy Minerals Inc. at the Yellow Jacket property in Santa Cruz county; Patriot Gold Corp., which put in 30 holes at the Moss Mine and planned more drilling; and Abington Ventures Inc. and Hellix Ventures Inc. at the Oakland and adjacent Verdstone gold mines.

Commodity Review

Industrial Minerals

Growth in the production and value of industrial minerals by Arizona producers continued. The Phoenix metropolitan area surpassed Atlanta to become the largest new market in the United States. A number of sales included the purchase by Western Power and Equipment Corp. of Arizona Pacific Materials LLC, which produced specialty basalt aggregate at the Queen Creek quarry in the southeastern corner of metropolitan Phoenix and cinders from the Apple pit near Flagstaff. Kildare Enterprises LLC purchased all American Sandstone's flagstone operations near Drake. Cemex S.A. purchased the RMC Group, which was the world's leading ready-mixed concrete maker, for $4.15 billion to expand its markets in Europe and in the United States. The purchase would have the opposite effect in one local market, Tucson, because the U.S. Federal Trade Commission was expected to require Cemex to divest the former holdings of RMC in Tucson during 2005 to reduce Cemex's market share. Some of the large publicly traded companies (for example, Rinker Materials Corp.) reported that they were benefiting from the construction boom in Arizona and the consequent increased prices for sand and gravel and cement block.

Metals

Copper.—The average U.S. producer cathode price for copper rose by 57% to $1.34 per pound in 2004 from $0.85 per pound in 2003, which accounted for the increase in the value of Arizona's copper production (table 1; Edelstein, 2005, p. 8).

Asarco's three operating mines produced about 154,000 t in 2004. Production fell by 14,000 t at the Ray Mine, increased slightly at the Mission Mine, and remained stable at the Silver Bell Mine. In April 2004, Asarco increased stripping to take advantage of the higher revenues and to achieve a long-term cash break-even point below $.75 per pound of copper. As a result, waste removal in 2004 increased by about 65% compared with that of 2003, while ore mined declined slightly. Increased costs were associated with the increased tonnage moved and with upgrading equipment maintenance to raise equipment availability levels to the industry standard levels. After Asarco completed 80% of its stripping objective at the Ray Mine, the mine returned to normal operations during the first quarter of 2005. The Mission Mine completed more than one-half of its stripping goal and was forecast to return to normal operations in mid-2005. Both mines were projected to achieve production increases of 40%.

[4]References that include a section mark (§) are found in the Internet References Cited section.

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Santa Cruz, which was an in situ leach research project and pilot producer that had been supported by the Federal Government, was sold by Asarco and its joint-venture partner Freeport-McMoRan Copper & Gold Inc. to one of the Nation's leading real estate developers. Freeport-McMoRan reported $21.3 million in income from the sale of the land, which included the deposit west of Casa Grande.

Phelps Dodge produced more than 75% of Arizona's copper production in 2004 and posted a record annual net income of more than $1 billion for 2004. Morenci produced 381,000 t that was recovered solely by leaching followed by solvent extraction (four plants) and electrowinning (three tank houses). In 2004, Morenci added reserves from the American Mountain, the Garfield, and the Shannon areas of Morenci.

Phelps Dodge's Bagdad Mine returned to full capacity during the second quarter of 2004 and produced 100,000 t of copper via concentration and leaching. The demonstration concentrate pressure-leach plant, which was in its second year of operation, processed 53,000 t of chalcopyrite concentrate and recovered 16,000 t of copper cathode, which was its design capacity. The plant averaged 98.9% extraction of copper from concentrate, which was slightly more than anticipated; the plant's availability averaged 83% in 2004. In March 2004, Phelps Dodge converted the facility to the medium-temperature mode of operation because this mode of operation generates significantly less sulfuric acid and requires less oxygen than the high-temperature process. The plant was shut down in December for the conversion, which will also include the adoption of new proprietary direct-electrowinning technology. The new configuration was scheduled for an 8-month test run.

Phelps Dodge's Sierrita Mine reached full capacity during the fourth quarter of 2004 and produced 70,000 t of copper, mostly from concentration. A new plant capable of producing approximately 18,000 metric tons per year of copper sulfate pentahydrate, which is an alternative to copper cathodes, was completed in late 2004. Phelps Dodge's byproduct 13,600 t of molybdenum production came largely from the Bagdad and Sierrita Mines. Both mines benefited from the threefold increase in the price of molybdenum oxide to more than $16 per pound.

Phelps Dodge began construction of a central analytical service center in Safford to provide services for the company's operations in Arizona and New Mexico. The center was expected to be completed in late 2005 and to replace the existing analytical facilities at most mine sites. A process technology center that employed approximately 96 engineers, scientists, and technical support staff was also at Safford. The activities at the technology center were directed at the development of new cost-competitive "step change" technologies and the continuous improvement of existing processes.

With no mining being done at Phelps Dodge's Miami Mine, production from existing leach dumps fell by 45% to less than 9,070 t of copper. With concentrate production up at Bagdad and Sierrita, the Miami smelter resumed operating at full capacity during the second quarter of 2004.

Phelps Dodge's Tohono Mine restarted operations to recover copper from existing leach piles during the fourth quarter of 2004 and resumed cathode production in January 2005. Mining had ceased in mid-1997, but leaching continued until early 1999. Mineralization reported for the Tohono deposit included 250 Mt milling material at a grade of 0.70% copper and 367 Mt leachable material at a grade of 0.63% copper.

In October 2004, Phelps Dodge and BioteQ Environmental Technologies Inc. formed the joint-venture company Copreco LLC and commissioned a new plant at Bisbee to recover copper. The plant incorporated a bioreactor to precipitate copper sulfide selectively from low-grade stockpile solutions that are then thickened and shipped to the Miami smelter. Through this process, the sludge is converted into a marketable product (rather than a material that requires disposal) and helps offset the cost of operating the plant.

Mercator Minerals Ltd. hired N.A. Degerstrom as the mining contractor and resumed mining and placing ore on a leach pad at Mineral Park in late July 2004. Despite heavy rainfall in early winter, production increased by 230 t to 1,700 t of copper. Expansion of the solvent extraction plant and piping was completed, and a drilling program to confirm/expand reserves and to define higher grade areas was started. Increased molybdenum prices caused Mercator to reevaluate the mine for the potential to once again recover molybdenum as well as copper.

Government Programs

In July, the U.S. Bureau of Land Management (BLM) issued its Record of Decision supporting a land exchange for a proposed copper mining operation at Safford. Two parties filed appeals to the decision. The BLM was expected to provide a response in early 2005. The planned operations for two deposits, Dos Pobres and San Juan, contain an estimated 488 Mt of leachable reserves at a grade of 0.37% copper.

More details about the geology and distribution of metallic commodities in Arizona can be found in Arizona Department of Mines and Mineral Resources OFR22-05 (Niemuth, 2005§).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARIZONA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Copper[3]	767	1,280,000	741	1,390,000	723	2,130,000
Gemstones	NA	1,670	NA	1,440	NA	1,450
Sand and gravel:						
Construction	53,800	294,000	62,600	340,000	79,600	430,000
Industrial	W	W	W	W	W	792
Stone, crushed	8,450	51,500 r	9,950	49,100	11,100	57,200
Combined values of cement, clays (bentonite, common), gold, gypsum, (crude), lime, mica (2002), molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone (dimension sandstone), zeolites (2004), and values indicated by symbol W	XX	318,000	XX	394,000	XX	709,000
Total	XX	1,950,000 r	XX	2,180,000	XX	3,330,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicab.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.

TABLE 2
ARIZONA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5	4,590	$22,900	$5.00	5	5,570	$21,900	$3.93	6	5,630	$22,900	$4.07
Marble	1	W	W	5.85	(2)	W	W	4.96	(2)	W	W	4.97
Granite	15 r	2,200 r	17,300 r	7.85 r	17	2,590	15,600	6.03	16	3,030	17,700	5.84
Traprock	1	W	W	5.51	2	W	W	4.83	3	W	W	7.56
Sandstone and quartzite	5 r	W	W	9.50 r	4	W	W	11.53	3	W	W	12.20
Volcanic cinder and sco	6	117	620	5.30	6	180	923	5.13	6	166	857	5.16
Miscellaneous stone	7	955	5,940	6.22 r	6	968	4,810	4.96	5	1,310	6,480	4.96
Total or average	XX	8,450	51,500 r	6.09 r	XX	9,950	49,100	4.94	XX	11,100	57,200	5.16

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Sales/distribution yards.

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TABLE 3a

ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	$10.87
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	3.98
Terrazzo and exposed aggregate	(2)	(2)	13.39
Crusher run (select material or fill)	(2)	(2)	1.10
Other coarse and fine aggregates	815	$2,470	3.03
Total or average	1,480	11,200	7.60
Other construction materials	235	1,330	5.67
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	4.03
Lime manufacture	(2)	(2)	3.08
Sulfur oxide removal	(2)	(2)	3.08
Total or average	4,680	17,500	3.74
Other miscellaneous uses and specified uses not listed	226	2,590	11.46
Unspecified:[3]			
Reported	1,070	5,500	5.16
Estimated	2,300	11,000	4.83
Total or average	3 330	16,400	4.93
Grand total or average	9,950	49,100	4.94

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data, included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$11.94
Other coarse aggregate	W	W	9.38
Total or average	17	$178	10.47
Coarse aggregate, graded:			
Bituminous aggregate, coarse	W	W	3.25
Railroad ballast	W	W	6.61
Other graded coarse aggregate	7	62	8.86
Total or average	956	3,170	3.32
Fine aggregate (-⅜ inch), other fine aggregate	132	1,170	8.82
Coarse and fine aggregates:			
Graded road base or subbase	193	1,230	6.37
Unpaved road surfacing	W	W	4.69
Terrazzo and exposed aggregate	W	W	12.23
Other coarse and fine aggregates	309	1,650	5.33
Total or average	1,480	14,600	9.87
Other construction materials	10	108	10.80
Agricultural, poultry grit and mineral food	(2)	(2)	4.68
Chemical and metallurgical:			
Cement manufacture	W	W	4.08
Lime manufacture	W	W	10.92
Total or average	3,150	13,300	4.23
Special, other fillers or extenders	(3)	(3)	4.69
Other miscellaneous uses and specified uses not listed	171	1,890	11.04
Unspecified:[4]			
Reported	1,410	7,130	5.05
Estimated	3,700	16,000	4.17
Total or average	5,160	22,800	4.41
Grand total or average	11,100	57,200	5.16

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[3]Less than ½ unit.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	--	--	W	W	--	--
Coarse and fine aggregate[3]	(4)	(4)	--	--	(4)	(4)	--	--
Other construction materials	17	129	--	--	218	1,200	--	--
Chemical and metallurgical[5]	(4)	(4)	--	--	(4)	(4)	--	--
Other miscellaneous use	--	--	--	--	226	2,590	--	--
Unspecified:[6]								
Reported	54	365	74	451	3	30	935	4,620
Estimated	220	1,100	220	1,100	1,800	8,900	--	--
Total	3,470	17,400	297	1,500	5,260	25,600	935	4,620

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone.

[3]Includes graded road base or subbase, terrazzo and exposed aggregate, crusher run (select material or fill), and other coarse and fine aggregates.

[4]Withheld to avoid disclosing company proprietary data; included in "Total."

[5]Includes cement and lime manufacture, and sulfur oxide removal.

[6]Reported and estimated production without a breakdown by end use.

TABLE 4b

ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--	--	--
Coarse aggregate, graded[3]	--	--	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	--	--	132	1,170	--	--	--	--
Coarse and fine aggregate[5]	616	6,880	170	1,130	691	6,570	--	--
Other construction materials	10	108	--	--	--	--	--	--
Agricultrual[6]	--	--	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	--	--	--	--	(9)	(9)	--	--
Other miscellaneous use	--	--	--	--	171	1,890	--	--
Unspecified:[10]								
Reported	46	281	74	451	--	--	1,290	6,380
Estimated	1,800	6,200	80	360	1,800	9,000	--	--
Total	3,760	19,100	510	3,600	5,510	28,100	1,290	6,380

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes other fine aggregate.

[5]Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes poultry grit and mineral food.

[7]Includes cement and lime manufacture.

[8]Includes other fillers or extenders.

[9]Less than ½ unit.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,120	$35,900	$5.87
Plaster and gunite sands	144	1,180	8.19
Concrete products (blocks, bricks, pipe, decorative, etc.)	113	935	8.26
Asphaltic concrete aggregates and other bituminous mixtures	3,620	19,200	5.31
Road base and coverings[2]	8,450	41,600	4.92
Fill	847	3,270	3.85
Railroad ballast	11	106	10.06
Other miscellaneous uses[3]	146	1,420	9.76
Unspecified:[4]			
Reported	29,600	162,000	5.48
Estimated	14,000	75,000	5.51
Total or average	62,600	340,000	5.44

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,000	$50,800	$5.08
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	179	1,480	8.26
Asphaltic concrete aggregates and other bituminous mixtures	2,910	17,600	6.04
Road base and coverings[3]	12,100	58,300	4.82
Fill	969	3,970	4.10
Snow and ice control	37	81	2.20
Railroad ballast	16	197	12.01
Filtration	680	3,880	5.71
Other miscellaneous uses	1,610	18,500	11.48
Unspecified:[4]			
Reported	42,200	229,000	5.42
Estimated	8,900	46,000	5.19
Total or average	79,600	430,000	5.40

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	313	2,380	200	1,890	5,610	31,600
Plaster and gunite sands	W	W	W	W	81	482
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	--	--	113	934
Asphaltic concrete aggregates and other bituminous mixtures	149	1,370	W	W	2,660	14,600
Road base materials	290	1,740	W	W	7,920	37,900
Fill	82	307	36	188	729	2,770
Snow and ice control	--	--	1	19	--	--
Other miscellaneous uses[2]	67	575	349	2,870	117	1,220
Unspecified:[3]						
Reported	3,940	21,400	820	2,750	24,400	137,000
Estimated	2,000	12,000	1,200	6,600	10,000	57,000
Total	6,880	39,400	2,600	14,300	51,900	283,000

Use	Unspecified district	
	Quantity	Value
Concrete aggregate (including concrete sand)	--	--
Plaster and gunite sands	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--
Asphaltic concrete aggregates and other bituminous mixtures	740	2,720
Road base materials	-4	-4
Fill	--	--
Snow and ice control	--	--
Other miscellaneous uses[2]	--	--
Unspecified:[3]		
Reported	452	748
Estimated	--	--
Total	1,190	3,470

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes railroad ballast.

[3]Reported and estimated production without a breakdown by end use.

[4]Less than ½ unit.

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TABLE 6b
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	W	W	9,350	43,800
Asphaltic concrete aggregates and other bituminous mixtures	W	W	50	311	2,430	15,400
Road base materials[3]	317	1,560	595	3,360	9,430	44,700
Fill	57	259	56	255	856	3,460
Other miscellaneous uses[4]	424	4,440	548	5,080	2,260	22,000
Unspecified:[5]						
Reported	6,260	33,700	554	3,040	34,600	191,000
Estimated	2,100	11,000	1,100	4,100	5,700	31,000
Total	9,180	51,300	2,860	16,200	64,700	351,000

	Unspecified district	
	Quantity	Value
Concrete aggregate and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W
Road base materials[3]	1,760	8,660
Fill	--	--
Other miscellaneous uses[4]	373	1,520
Unspecified:[5]		
Reported	781	1,290
Estimated	5	8
Total	2,920	11,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration, railroad ballast, and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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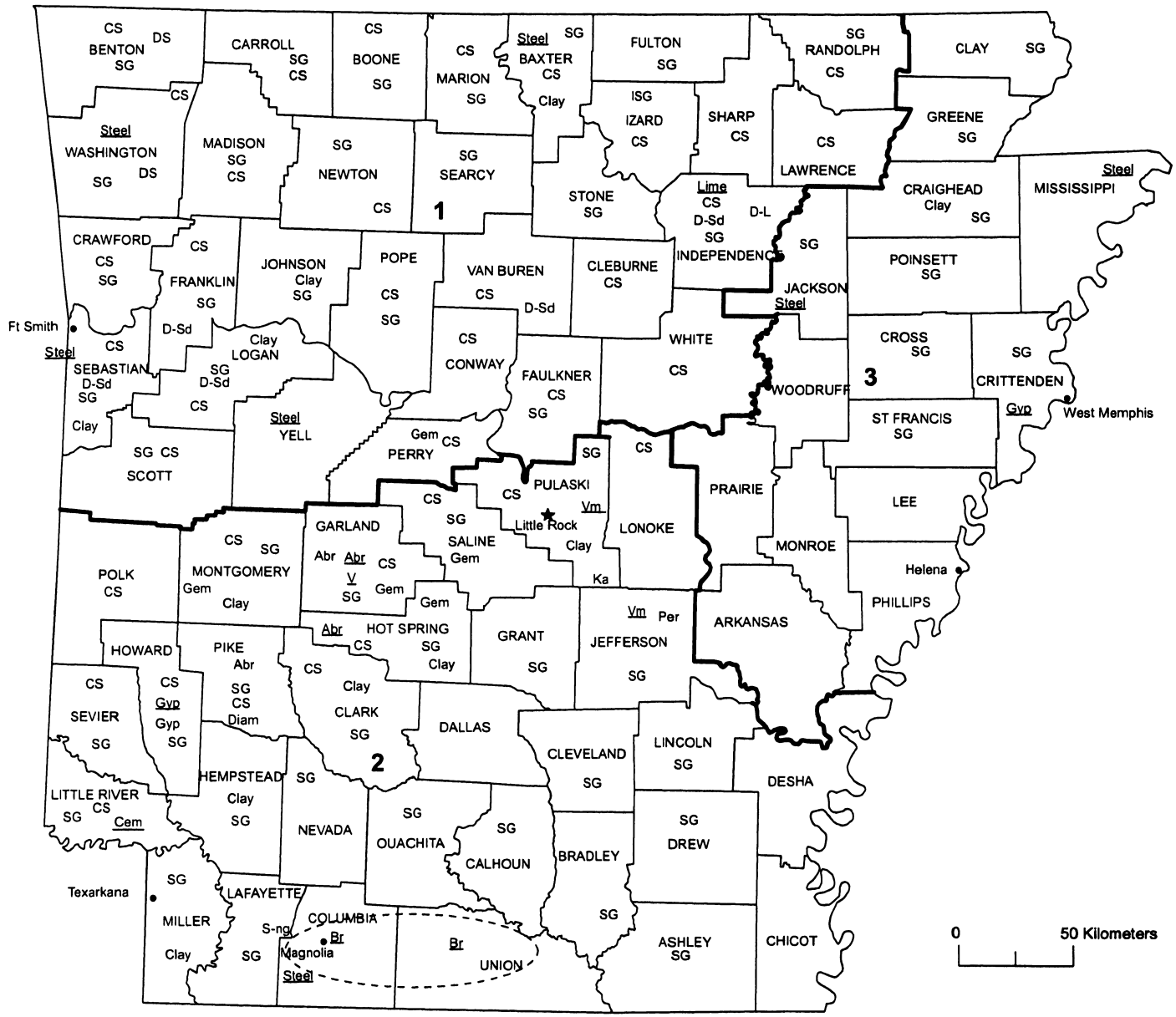
ARKANSAS



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Abr	Abrasives
Abr	Abrasives plant
Br	Bromine plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Diam	Diamond
D-L	Dimension limestone
DS	Dimension stone
D-Sd	Dimension sandstone
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
ISG	Industrial sand and gravel
Ka	Kaolin
Lime	Lime plant
Per	Perlite
SG	Construction sand and gravel
S-ng	Sulfur (natural gas)
Steel	Steel plant
V	Vanadium plant
Vm	Vermiculite plant
	Concentration of mineral operations

Source: Arkansas Geological Commission/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Commission for collecting information on all nonfuel minerals.

In 2004, Arkansas' nonfuel raw mineral production was valued[1] at $518 million based upon annual U.S. Geological Survey (USGS) data. This was a 13.8% increase compared with that of 2003[2] and followed a marginal decrease from 2002 to 2003. The State increased in rank to 29th from 30th among the 50 States in total nonfuel mineral production value in 2004 and accounted for more than 1% of the U.S. total.

In 2004, bromine, followed by crushed stone, cement (portland and masonry), and construction sand and gravel, were Arkansas' leading nonfuel minerals by value; altogether these commodities accounted for about 92% of the State's total nonfuel mineral value. Since 1969, bromine has been the State's leading nonfuel mineral except during the years 1996-98 and 2001-03 when it ranked second to crushed stone. For longer than a decade, cement has ranked third and construction sand and gravel has ranked fourth. Actual production data for bromine and cement have been withheld to avoid disclosing company proprietary data.

Most of Arkansas' nonfuel minerals increased in production value in 2004. Bromine production, which increased slightly, lead the way with a nearly $35 million increase in value. It was followed by crushed stone and lime, which were up by $15 and nearly $9 million, respectively. Lime production increased significantly. Smaller yet significant increases took place in the values of industrial sand and gravel, construction sand and gravel, and common clays (descending order of change). The value of gemstones was up by about 24%. Only portland cement and tripoli values were down, slightly (table 1).

During 2003, the production values of portland cement, construction sand and gravel, and gypsum increased by about $10 million, $6.6 million, and nearly $5 million, respectively. Also, tripoli showed a small increase in value. Decreases in the values of crushed stone, bromine, and common clays, which were down by a combined $24 million, outweighed the gains however, and resulted in the State's small net decrease for the year. The value of gemstones was down by about 25% (table 1).

Arkansas continued to be the leading bromine-producing State in 2004 and accounted for most U.S. production. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface, bromine-rich natural brines by submersible pump for subsequent processing. Arkansas continued to be the only State that produced silica stone; it ranked third of four tripoli-producing States and fifth in gemstones. Even though gypsum production was up by about 13%, the State decreased in rank to ninth from eighth. Additionally, significant quantities of crushed stone, industrial sand and gravel, and common clays (11th in rank) were produced in the State. The State's metal (mostly raw steel) production resulted from used materials received from other domestic and foreign sources.

Strategic Minerals Corp. continued operation of the mill facility at Potash Sulphur Springs in Garland County; the mill extracts vanadium pentoxide from recycled out-of-State vanadium-bearing feed.

The Arkansas Geological Commission[3] (AGC) provided the following narrative information.

Commodity Review

Industrial Minerals

Crushed Stone.—Arkhola Sand and Gravel Co. continued to explore for additional quarry sites in the western portion of the Arkansas River Valley. Arkhola produced road aggregates and asphalt mix at the Preston Quarry near Van Buren in Crawford County. Arkhola continued to work a Hartshorne Sandstone quarry near the Jenny Lind Mine in Sebastian County. Bobby Plant Asphalt Co., which was based in Murfreesboro, Pike County, produced crushed stone from its quarry in the Jackfork Sandstone (Lower Pennsylvanian) south of Kirby in central Pike County.

Duffield Stone and Gravel Co. operated two sandstone aggregate quarries (Pennsylvanian) in Pope County; one in the Hartshorne Sandstone at Russellville, and the other, the Gumlog Quarry, in the upper Atoka Formation. The company continued exploration in the Arkansas River Valley. Pyramid Co. produced aggregate from the middle Atoka Formation (Pennsylvanian) north of Greenbrier in Faulkner County. McClinton-Anchor, Inc. continued to explore for new aggregate quarry sites in the limestone-bearing region of northwest Arkansas.

Granite Mountain Quarries, Inc. (GMQ) produced aggregate from nepheline syenite at two quarries in Pulaski County and from the Granite Mountain No. 3 quarry near Bryant in Saline County. GMQ continued evaluating two other sites—one in the lower Atoka Formation west of Boles in southern Scott County and another in the Hartshorne Sandstone west of Greenwood in Sebastian County. Martin Marietta Co. actively quarried the Hatton Tuff lentil of the Stanley Group (Mississippian) at the

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]J. Michael Howard, Geology Supervisor/Mineralogist, authored the text of the State mineral industry information provided by the Arkansas Geological Commission.

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Hatton Quarry in southern Polk County. The company acquired new leases east of the quarry site to near the Cossattot River and was to install a third crusher and processing unit at this site. Martin Marietta continued operations at the 270 Quarry near Magnet Cove in Hot Spring County and produced from the hornfels and quartzite alteration zone in the Stanley Group adjacent to the Cretaceous igneous intrusion. The company operated an asphalt plant at this site; the plant was built in 2000.

Rogers Group, Inc. continued sandstone aggregate operations at its Greenbriar Quarry in the middle Atoka Formation in Faulkner County, at its Conway County Quarry in upper Atoka Formation south of Solgohacia, and at its Lowell Quarry in the limestone of the Boone Formation (Mississippian) in southern Benton County. Schwartz Stone Co. quarried sandstone from the Hartshorne Sandstone quarry for aggregate and dimension stone north of Midway in Logan County. Texas Industries Group continued to evaluate tuff deposits on leases in southern Polk County. McGeorge Sand and Gravel Co. continued riprap barge operations along the Arkansas River from its River Mountain Quarry in the Hartshorne Sandstone area north of New Blaine in eastern Logan County. Chrisman Co. mined sandstone aggregate in the Hartshorne Sandstone area near Hunt in Johnson County and from the Savanna Formation near Ratcliffe in Franklin County.

Vulcan Materials Co., which was based in Birmingham, AL, produced aggregate from its upper Morrowan age sandstone operations at Judsonia and middle Atokan age sandstones at Floyd; both sites are in White County. Vulcan also produced dolomitic limestone from lower Ordovician units near Black Rock in Lawrence County. Vulcan continued aggregate exploration, with the focus on Morrowan and Atokan age sandstones in White and Cleburne Counties. Webco Mining produced crushed stone from its quarry in the middle Atoka Formation near El Paso in White County.

Gypsum.—In 2004, BPB Gypsum, which is near Nashville in Howard County, continued to be the world's largest wallboard manufacturing plant, with a capacity of 130 million square meters per year. The plant and mines employed about 200 people in 2004. The principal markets for the wallboard were in the eastern United States. The wallboard was shipped by rail and truck.

Nepheline Syenite.—Minnesota Mining and Manufacturing Co. mined nepheline syenite from its Big Rock Arch Street Quarry to supply its roofing granule plant in Sweet Home, Pulaski County. Martin Marietta continued concurrent mining of syenite dike rock for aggregate in this quarry.

Sand and Gravel.—One hundred sand and gravel operations were active in Arkansas in 2003 and 110 were active in 2004; the greatest number of these operations were in the southeastern part of the State (the Gulf Coastal Plain). Eighteen new sand and gravel operations were permitted by the Surface Mining and Reclamation Division of the Arkansas Department of Environmental Quality (ADEQ) in 2004. By the end of 2004, 30 Quarry Notifications of Intent were on file. During 2004, ADEQ issued three Authorizations to Quarry pursuant to the Arkansas Quarry Operation, Reclamation and Safe Closure Act. These Authorizations to Quarry were issued to Arkhola Sand and Gravel in Sebastian County, to Chrisman Ready Mix in Johnson County, and to Quality Rock, Inc. in Cleburne County.

Other Industrial Minerals.—Albermarle and Great Lakes Chemical Co. continued operations at their bromine extraction and production plants, which were in Columbia and Union Counties, respectively. Prices for bromine-based products steadily increased worldwide during the year. In 2004, Great Lakes Chemical Corporation announced that it will add a new bromine supply well for the extraction of elemental bromine at the company's South Arkansas facility and double its capacity to produce the polybrominated styrene (PBS) series of performance brominated flame retardants to meet strong industry demand. Expansion of the elemental bromine and PBS flame retardant facilities will be completed by the end of the first quarter 2005.

Mark Wallis Whetstones continued sporadic operation of a whetstone-grade mine south of Lonsdale near the Saline-Hot Spring County line. Martin Marietta obtained control of the Butterfield Quarry in Hot Spring County in 2004, but the quarry was inactive during the year. Martin Marietta also produced aggregate and high-silica novaculite from a quarry near Glen Rose in Hot Spring County. Smith Whetstone, Inc. of Hot Springs in Garland County manufactured a variety of grades of oilstones (whetstones) from its Arkansas Novaculite (Mississippian-Devonian) quarry operations. Malvern Minerals Co. of Hot Springs, Garland County, produced tripoli from its mine in the Bigfork Chert (Middle and Late Ordovician).

Oran McBride Stone Co. of Batesville in Independence County continued production of interior and exterior structural and architectural stone at its plant in Bethesda. Polished, cut, and rough surface marble, limestone, and sandstone were quarried from Ordovician–age formations and processed. Bennett Brothers Stone Co., Inc. obtained building stone materials from deposits in Franklin, Logan, Garland, and other counties.

Ash Grove Cement Co., which was the sole producer of cement in the State, operated the Foreman plant in Little River County using chalk from the Annona Formation and silica from the Marlbrook Formation (both Cretaceous). Arkansas Lime Co. of Batesville, Independence County, produced quick lime, hydrated lime, and pulverized limestone for glass manufacturing and agriculture lime. Their quarry is in a section of the Boone Formation (Mississippian) that is high purity and low in silica (chert). Acme Brick Co., which was owned by Berkshire-Hathaway, is near Malvern in Hot Spring County. Acme continued operation of its Wilcox Group (Eocene) clay mines for brick production at Perla.

Environmental Issues and Mine Reclamation

Alcoa Inc. is approximately two-thirds finished with a 20-year land reclamation project of former bauxite properties adjacent to the community of Bauxite in Saline County. Alcoa's reclamation project includes a large acreage of pre-land-reclamation-law land. Umetco, Inc. continued the reclamation of the Wilson Springs vanadium mines area in Garland County that began in 1997. The Black Lick diamond property, which

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was reclaimed by Star Resources Corp. of Houston, TX, is northeast of the Crater of Diamonds State Park in Pike County; Star is awaiting release of its bond money.

Government Programs

During 2004, 187 noncoal mine sites were active, permitted, or authorized in Arkansas. The total noncoal area under permit was nearly 12,060 hectares (ha), and there was about 250 ha of reclaimed land released from eight permitted sites during 2004. No amendments or changes to State laws and/or regulations concerning mining and/or mine reclamation were made in Arkansas during 2004.

Operators of 27 quartz contracts with the U.S. Department of Agriculture's Forest Service on the Ouachita National Forest in Arkansas generated about $13,500 in revenue and approximately $5,000 more on three producing leases. In 2004, 383 diamonds were recovered at the Crater of Diamonds State Park. The total carat weight of the stones was 58.72, with an average weight of 0.15 carats. Of these 383 diamonds, 5 weighed more than 1 carat. Diamonds recovered included 231 white, 90 brown, and 62 yellow. The largest stone recovered in 2004 was brown and weighed 3.10 carats. More than 22,000 diamonds have been recovered since this property became a State Park in 1972. Plans for the park include a new museum. In autumn of 2003, the park hosted the U.S. Mint's unveiling of the Arkansas State Quarter, which features a diamond at the center of the new reverse design. Construction of a new water park and adjacent visitor's facilities, including a classroom, were completed in 2004.

The AGC Web site at URL http://www.state.ar.us/agc/agc.htm hosted nearly 98,000 visitors in 2004, which was its 6th year of online operation; the number of visitors represented a 24% increase compared with that of 2003. Information posted on the Web site includes State resource data; USGS annual nonfuel mineral production data; publications and map ordering information; State stratigraphic, geologic and geohazard data; Arkansas Board of Registration for Professional Geologists; agency services; and news items. The site includes links to State agency services, Federal agencies, geology Web sites, organizations, and universities.

The AGC staff also prepared a spreadsheet database that contains all identified sites of mineral extraction in the State, excluding petroleum and natural gas. By the close of 2004, more than 7,200 entries had been made. Approximately 50% of those entries remain to be field checked. Sites are located by latitude and longitude and by general land office survey techniques.

The AGC has been an active participant in the STATEMAP program since 1995. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. During 2004, three digitized 7.5-minute USGS topographic geologic maps were completed under the STATEMAP cooperative agreement, and three additional maps were started. Staff cartographers completed the digitization of an additional nine USGS 7.5-minute topographic geologic maps, primarily in southwestern Arkansas, with legends. An effort has been undertaken to digitize all or part of 10 USGS topographic geologic maps scaled 1:100,000 in west-central Arkansas. Additional information about the STATEMAP geologic mapping program in Arkansas can be found on the AGC Web site.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARKANSAS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Clays, common		922	2,280	897	1,410	1,150	1,510
Gemstones		NA	637	NA	477	NA	590
Sand and gravel, construction		8,810	45,600	9,720	52,100	9,370	53,500
Silica stone[3]	metric tons	386	3,740	513	3,630	655	3,660
Stone, crushed		30,600 r	158,000 r	29,700	145,000	32,900	161,000
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone ([dimension limestone and sandstone), tripoli		XX	247,000	XX	252,000	XX	298,000
Total		XX	457,000 r	XX	454,000	XX	518,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

TABLE 2
ARKANSAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	26 r	7,860 r	$41,200 r	$5.25 r	25	8,820	$42,700	$4.85	27	10,500	$48,300	$4.59
Dolomite	2	W	W	5.35	2	W	W	5.18	2	W	W	5.19
Granite	5 r	9,400	51,500	5.48	5	9,460	44,400	4.70	5	9,620	45,200	4.70
Sandstone and quartzite	18 r	10,300 r	49,600 r	4.83 r	17	9,320	47,100	5.05	19	10,500	56,100	5.33
Slate	1	W	W	4.52	1	W	W	4.41	1	W	W	4.41
Miscellaneous stone	3	W	W	4.63	3	W	W	4.68	3	W	W	4.82
Total or average	XX	30,600 r	158,000 r	5.16	XX	29,700	145,000	4.87	XX	32,900	161,000	4.89

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	107	$685	$6.40
Filter stone	W	W	5.24
Other coarse aggregates	282	1,690	5.99
Total or average	389	2,370	6.10
Coarse aggregate, graded:			
Concrete aggregate, coarse	452	2,820	6.25
Bituminous aggregate, coarse	(2)	(2)	6.28
Bituminous surface-treatment aggregate	(2)	(2)	7.85
Railroad ballast	(2)	(2)	3.80
Other graded coarse aggregates	1,080	7,460	6.93
Total or average	1,530	10,300	6.73
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(3)	(3)	5.52
Screening, undesignated	490	1,980	4.04
Other fine aggregates	194	1,290	6.64
Total or average	684	3,270	4.78
Coarse and fine aggregates:			
Graded road base or subbase	2,480	14,500	5.83
Unpaved road surfacing	(4)	(4)	7.66
Crusher run (select material or fill)	(4)	(4)	3.80
Roofing granules	(4)	(4)	4.41
Other coarse and fine aggregates	4,300	19,900	4.62
Total or average	6,780	34,300	5.06
Other construction materials	56	168	3.00
Agricultural:			
Limestone	284	1,530	5.40
Poultry grit and mineral food	(5)	(5)	11.81
Other agricultural uses	81	877	10.83
Total or average	365	2,410	6.60
Chemical and metallurgical:			
Cement manufacture	(6)	(6)	1.41
Lime manufacture	(6)	(6)	4.19
Glass manufacture	(6)	(6)	10.46
Total or average	1,830	3,930	2.15
Special:			
Asphalt fillers or extenders	(7)	(7)	14.98
Other fillers or extenders	(7)	(7)	12.08
Other miscellaneous uses and specified uses not listed	1	5	5.00
Unspecified:[8]			
Reported	10,600	51,700	4.88
Estimated	7,300	34,000	4.68
Total or average	17,900	86,100	4.80
Grand total or average	29,700	145,000	4.87

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."
[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[5]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."
[6]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[7]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[8]Reported and estimated production without a breakdown by end use.

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TABLE 3b
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	139	$843	$6.06
Filter stone	140	765	5.46
Other coarse aggregates	92	554	6.02
Total or average	371	2,160	5.83
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,010	6,660	6.59
Bituminous aggregate, coarse	142	815	5.75
Bituminous surface-treatment aggregate	W	W	7.46
Railroad ballast	W	W	5.76
Other graded coarse aggregates	1,090	7,430	6.84
Total or average	2,240	14,900	6.66
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	5.14
Stone sand, bituminous mix or seal	70	467	6.62
Screening, undesignated	473	2,080	4.40
Other fine aggregates	427	2,520	5.89
Total or average	970	5,070	5.22
Coarse and fine aggregates:			
Graded road base or subbase	3,740	21,500	5.77
Unpaved road surfacing	60	502	8.34
Crusher run or fill or waste	(3)	(3)	5.41
Roofing granules	(3)	(3)	4.41
Other coarse and fine aggregates	4,230	19,500	4.60
Total or average	8,030	41,500	5.17
Other construction materials	38	164	4.34
Agricultural:			
Limestone	119	649	5.45
Other agricultural uses	10	47	4.70
Total or average	129	696	5.40
Other miscellaneous uses and specified uses not listed	1	4	4.00
Unspecified:[4]			
Reported	12,600	56,200	4.46
Estimated	8,500	40,000	4.70
Total or average	21,100	96,400	4.56
Grand total or average	32,900	161,000	4.89

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	345	2,190	W	W	(3)	W
Coarse aggregate, graded[4]	1,520	10,200	W	W	W	W
Fine aggregate (-⅜ inch)[5]	643	3,200	W	W	W	W
Coarse and fine aggregate[6]	3,220	17,100	W	W	W	W
Other construction materials	46	139	10	29	--	--
Agricultural[7]	365	2,410	--	--	--	--
Chemical and metallurgical[8]	W	W	W	W	--	--
Special[9]	W	W	--	--	--	--
Other miscellaneous uses	--	--	1	5	--	--
Unspecified:[10]						
Reported	7,110	34,800	3,480	16,900	--	--
Estimated	2,500	11,000	4,800	23,000	--	--
Total	16,300	85,100	13,400	59,600	10	124

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Less than ½ unit.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), and other fine aggregates.

[6]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[7]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8]Includes cement, glass, and lime manufacture.

[9]Includes asphalt fillers or extenders and other fillers and extenders.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	2,220	14,800	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	4,380	23,500	W	W	W	W
Other construction materials	25	120	13	44	--	--
Agricultural[6]	129	696	--	--	--	--
Other miscellaneous uses[7]	--	--	1	4	--	--
Unspecified:[8]						
Reported	7,480	36,600	5,130	19,600	--	--
Estimated	3,500	16,000	5,000	24,000	--	--
Total	19,000	98,500	13,900	62,300	9	103

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes other specified uses not listed.

[8]Reported and estimated production without a breakdown by end use.

TABLE 5a
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	2,680	$15,800	$5.88
Asphaltic concrete aggregates and other bituminous mixtures	1,040	7,440	7.16
Road base and coverings	383	1,680	4.39
Fill	197	325	1.65
Other miscellaneous uses[3]	100	1,180	11.80
Unspecified:[4]			
Reported	3,500	16,200	4.63
Estimated	1,800	9,500	5.24
Total	9,720	52,100	5.36

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 5b

ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	2,520	$15,600	$6.19
Asphaltic concrete aggregates and other bituminous mixtures	458	3,620	7.91
Road base and coverings	300	1,560	5.20
Fill	65	266	4.12
Other miscellaneous uses[3]	72	1,380	19.18
Unspecified:[4]			
Reported	4,140	22,000	5.31
Estimated	1,800	9,000	4.98
Total	9,370	53,500	5.70

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes snow and ice control and filtration.

[4]Reported and estimated production without a breakdown by end use.

TABLE 6a

ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	309	2,070	1,450	8,890	929	4,830
Asphaltic concrete aggregates and road base materials	W	W	318	2,210	W	W
Road base and coverings	--	--	157	1,040	227	647
Fill	46	120	131	174	20	31
Other miscellaneous uses[3]	54	381	57	910	710	5,120
Unspecified:[4]						
Reported	1,730	7,420	1,770	8,760	--	--
Estimated	450	2,400	1,100	5,600	300	1,500
Total	2,590	12,400	4,950	27,600	2,180	12,100

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 6b

ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	264	1,860	1,320	8,520	933	5,230
Asphaltic concrete aggregates and road base materials	W	W	W	W	148	1,470
Road base and coverings	--	--	173	1,140	128	420
Fill	11	101	33	126	20	39
Other miscellaneous uses[3]	26	201	354	3,320	2	5
Unspecified:[4]						
Reported	1,480	6,890	1,610	8,490	1,060	6,610
Estimated	480	2,400	1,100	5,500	200	1,100
Total	2,260	11,500	4,620	27,100	2,490	14,900

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

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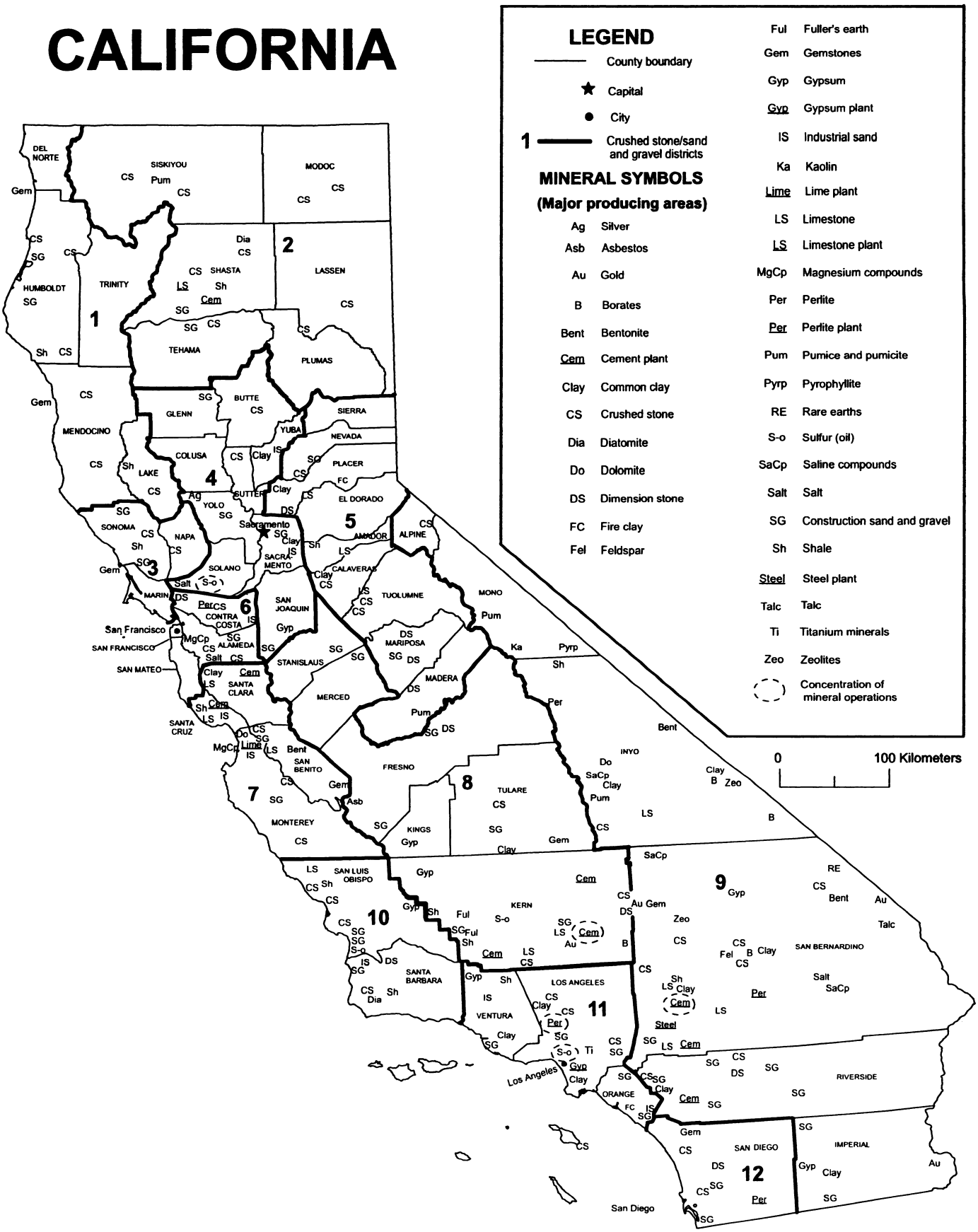

Source: California Department of Conservation, California Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF CALIFORNIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the California Geological Survey for collecting information on all nonfuel minerals.

In 2004, California's nonfuel raw mineral production was valued[1] at $3.76 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of nearly 10% from that of 2003[2] and followed a 0.6% increase from 2002 to 2003. For the sixth consecutive year, the State led the Nation in nonfuel mineral production value, of which California accounted for more than 8% of the U.S. total.

Industrial minerals accounted for nearly 99% of California's nonfuel mineral value; the remaining value resulted from the mining of gold, silver, and iron ore (descending order of value). In 2004, California continued as the leading construction-sand-and-gravel-producing State, accounting for more than 13% of the commodity's total U.S. mine production and nearly 19.5% of the Nation's total value for that mineral commodity. Construction sand and gravel was, by value, also the State's leading nonfuel mineral, accounting for approximately 34% of the State's total nonfuel mineral production value. Cement (portland and masonry) was the second leading nonfuel mineral, followed by boron minerals, crushed stone, diatomite, and soda ash; these six accounted for nearly 94% of the State's total industrial mineral value (table 1).

In 2004, increases in the production and values of construction sand and gravel, value up $130 million, portland cement, up $113 million, boron, up $35 million, and masonry cement led California's increase in nonfuel mineral production value for the year. Substantial increases also took place in diatomite and soda ash, the values of which were up more than $8 million each, industrial sand and gravel, up nearly $6 million, and salt, up about $5 million. The largest decreases in value were those of gold, down about $7 million, crushed stone, down $6 million, and kaolin, down less than $3 million. All other changes in value, nearly all increases, were less than $1 million (table 1).

In 2003, the mineral commodities having the most substantial increases in value were those of boron minerals, up $78 million, construction sand and gravel, up by $40 million, portland cement, up by $34 million, and fuller's earth, up by more than $11 million. Additionally, industrial sand and gravel and gypsum were up by more than $2 million each. The largest decreases were those of crushed stone, down by $52 million, gold, down by nearly $42 million, masonry cement, down more than $8 million, and soda ash, down about $5 million. Also down were the values of salt, common clays, and pumice, down $3 million, about $2 million, and $1 million, respectively. All other changes were of less than $1 million, having comparatively little effect on the change in overall total value (table 1).

California continued to be the Nation's only State to produce boron in 2004 and remained first in the production of construction sand and gravel and of portland cement (descending order of value). The State continued to be second among three States that produced soda ash, was second in masonry cement; third in feldspar; fourth in gemstones (based upon value); fifth in industrial sand and gravel and magnesium compounds; and sixth in common clays. While California rose to 1st from 2d in the production of diatomite and to 5th from 6th in gold, it decreased to 5th from 4th in pumice and pumicite and in crude gypsum, to 7th from 6th in fuller's earth, and to 13th from 10th in crushed stone. Additionally, California was a significant producer of salt and dimension stone.

The following narrative information was provided by the California Geological Survey (CGS).[3]

There were about 1,156 active mines producing nonfuel minerals in the State. Approximately 11,000 people were employed at these mines and their processing plants.

Commodity Review

Industrial Minerals

Cement.—In September 2004, CEMEX, the world's third leading cement producer, announced its plans to acquire RMC Pacific Materials Inc. The proposed $5.8 billion acquisition, expected to be completed in early 2005, would make CEMEX the world's leading concrete supplier. RMC Pacific Materials Inc., the current largest supplier of ready-mixed concrete, operated 9 aggregate mines, 55 ready-mix facilities, and 4 cement facilities in the San Francisco Bay, Monterey Bay, and Central California regions. Iron ore mined in California was used in the production of portland cement and was considered an industrial mineral.

Crushed Stone and Sand and Gravel.—Vulcan Materials Company/Western Division's Boulevard Plant (Los Angeles County) continued to lead the State and the Nation in sand and gravel production.

Importation of stone and sand and gravel by ship and barge from Canada and Mexico to California ports continued to take place in the San Francisco and San Diego bay areas. California imported about 1.8 million metric tons (Mt) of sand and gravel during 2004.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Susan Kohler, Senior Engineering Geologist, authored the text of information submitted by the California Geological Survey.

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After 10 years of negotiations, the United Rock Products Corp. and the city of Irwindale (Los Angeles County) agreed to a settlement in August that will allow deepening of two of the company's existing pits down to 125 meters (m) and 134 m. The increased mining depth will allow United Rock to mine an additional 36 Mt of aggregate (stone and sand and gravel) that will supply the San Gabriel Valley area. The settlement also required United Rock to pay the city of Irwindale about $4 million in back mining taxes.

Kiewit Pacific Co. acquired a permit in September to mine about 3.6 Mt of crushed rock in the Newberry Springs Area (San Bernardino County). The mine site will also include an asphalt plant. Kiewit planned to use the asphalt and rock for its own construction projects such as the Caltrans rehabilitation of Interstate 15 between Barstow and Rasor Road.

Rhodes and Jamieson LLC submitted a draft plan to the Alameda County Planning Commission in December to mine 86 hectares (ha) of alluvial sand and gravel in the Pleasanton Area. If approved, the proposed project would provide approximately 45 Mt of construction-grade sand and gravel to the South San Francisco Bay Region.

Santa Fe Aggregates Inc. received county approval in March to mine a 14-ha site along the Tuolumne River (Stanislaus County) containing 4.4 Mt of alluvial sand and gravel. The project was in litigation. The company also received approval in January to mine a 170-ha expansion area of its Winton mining operation located along the Merced River (Merced County). The expansion will add 23.1 Mt of alluvial sand and gravel reserves to the Merced area.

Eleven years after the initial approval of the project, a ruling made in November by the Court of Appeal in San Francisco allows Mission Valley Rock Co. to mine 39 Mt of construction-grade sand and gravel from a 56-ha site in the city of Sunol (Alameda County). Mission Valley Rock planned to start producing sand and gravel from the site in 2007 to 2008.

Vulcan submitted an application to Alameda County in the fall of 2004 to mine 146 ha of land adjacent to its current operation in Pleasanton.

Kaweah River Rock Co. continued the permitting process to mine 113 ha of land south of its existing operation. If approved, the permit will add an additional 14 to 18 Mt of reserves to the northern Tulare County area. A final decision by the County Board of Supervisors was expected in spring of 2005.

RMC Pacific Materials Inc. continued its permitting process to mine 200 Mt of crushed stone at Jessie Morrow Mountain (Fresno County) near the town of Friant.

CEMEX's controversial proposed 186-ha, 71-Mt Soledad Canyon sand and gravel mining project (Los Angeles County) was approved by the County Board of Supervisors in June 2004. The project was denied by the board and has been in litigation since 2002.

Rare Earths.—Molycorp Inc.'s plan and subsequent permit was approved in July 2004 to enlarge the current pit and construct a new onsite tailings impoundment and evaporation pond for its Mountain Pass rare-earths mine (San Bernardino County). The approval will allow the existing pit to be mined down to 230 m below ground surface (an additional 76 m) and will increase mine life by 30 years. The Mountain Pass Mine has been shut down since 1998 when Molycorp Inc. was cited for spilling low-level radioactive waste from a broken pipeline. Until its closure, Molycorp was the only producer of rare earths in the United States. Unocal Corporation (Molycorp's parent company) was acquired by Chevron Corporation in August 2005, after a failed takeover attempt by the Chinese oil company, China National Offshore Oil Corporation.

Mitsubishi Cement Corp. received its permit for an 81-ha expansion of its Cushenbury Limestone Mine (San Bernardino County) in October 2004. The expansion will add at least 45 Mt of cement-grade limestone reserves to the existing mine.

Metals

Gold.—Despite the increase in gold prices, California's production continued to decline drastically. In 2004, production amounted to 2,800 kilograms (kg) per year, down 37% from that of 2003. Total value amounted to about $36.3 million, down about 29% from last year's value of $51.3 million. In the past 5 years (since 1999) California's gold production has decreased by almost 85%, while the Nation's gold production has decreased 28%.

California had only four major producing gold mines in 2004. Mining was no longer taking place at these four properties, but gold processing continued from heap leaching. These included Glamis Rand Mining Company's Rand Mine (Kern County), Canyon Resources Corporation's Briggs Mine (Inyo County), Western Goldfields Inc.'s Mesquite Mine (Imperial County), and Quest Capital Corporation's and MK Resources Company's Castle Mountain Mine joint venture (San Bernardino County).

The Briggs Mine led the State in gold production. Mining operations ceased in April 2004, but ore processing continued from heap leaching to produce a total of 920 kg of gold for the year. Leaching of the 21.3 Mt of ore on the pad will probably be completed by yearend 2005. During the mine's 8-year life span up through 2004, the Briggs Mine has produced 16,900 kg of gold and 4,741 kg of silver. Gold production was expected to continue into 2006.

California's second leading gold producer for the year was Western Goldfields Inc.'s Mesquite Mine, acquired from Newmont Mining Corp. in November 2003. Mining operations ceased in May 2001, but Western Goldfields Inc. has announced plans to restart open pit mining operations late in 2006 in an expanded portion of the mine that was permitted in spring 2002. The company also considered retreating the existing heaps for additional gold recovery. The new expanded area was thought to contain almost 45 Mt of gold ore averaging 0.72 gram per metric ton containing about 31,000 kg of recoverable gold.

The Rand Mine had ceased mining operations in January 2003, and the mining equipment was moved to the company's Marigold Mine in Nevada. Glamis has operated the Rand Mine since 1984. Upon completion of the heap leaching, expected in 2005, the mine will have recovered nearly 31,000 kg of gold during its 15-year life. Glamis had no plans to reopen the mine.

Ore recovery continued at the Castle Mountain Mine through 2004 and will continue into 2005. Mining ceased in 2001. The mine was currently undergoing reclamation activities.

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In addition to the above-mentioned mines, gold was produced as a secondary mineral at numerous alluvial sand and gravel mines mainly in the northern and central part of the State. California also had several small underground gold mines that mainly produced specimen gold.

Silver.—Silver production made up less than 1% of California's total metal production. All of the silver produced in California was a byproduct of gold production.

Mine Reclamation

The CGS Mineral Land Classification Project, a mandate of the Surface Mining and Reclamation Act, continued to provide lead agencies with mineral resource maps that have proved to be of great value in land-use planning and mineral resource conservation. To date, CGS has classified a little more than one-third of the State for mineral resources. In 2004, CGS completed a comprehensive aggregate resource study for Sonoma County (CGS Special Report 175). The report included an aggregate resource classification map of the county at 1:125,000 scale, an evaluation of permitted and nonpermitted aggregate resources including quantity estimates, a 50-year aggregate demand projection, and an evaluation of potential alternative resources. CGS also had ongoing aggregate classification projects in the San Bernardino and Palm Springs area (San Bernardino County) and the Claremont-Upland area (Los Angeles County). CGS staff was conducting a statewide constituent survey to determine the most critical areas in the State that are in need of Mineral Land Classification.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CALIFORNIA[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Asbestos	metric tons	2,770	1,380	--	--	--	--
Boron minerals		1,050	513,000	1,150	591,000	1,210	626,000
Cement, portland		11,200	853,000 e	11,600	887,000 e	11,900	1,000,000 e
Clays:							
Bentonite		26	2,830	23	2,560	24	2,640
Common		1,030	21,400	1,240	19,100	1,230	20,700
Fuller's earth		W	W	W	W	197	W
Gemstones		NA	1,040	NA	1,080	NA	1,070
Gold[3]	kilograms	9,180	91,900	4,270	50,100	3,260	43,000
Sand and gravel:							
Construction		151,000	1,110,000	152,000	1,150,000	166,000	1,280,000
Industrial		1,800	48,000	1,790	50,100	1,990	55,700
Silver[3]	kilograms	3,400	506	957	151	801	172
Stone:							
Crushed		67,400	423,000	55,500	371,000	55,400	365,000
Dimension		41	9,870	40	9,920	42	10,200
Combined values of cement (masonry), clays [fire (2002), kaolin], diatomite, feldspar, gypsum (crude), iron ore (usable), lime, magnesium compounds, perlite (crude), pumice and pumicite, pyrophyllite [crude (2003)], rare-earth metal concentrates (2002), salt, soda ash, talc (crude), zeolites (2004), and values indicated by symbol W		XX	340,000 r	XX	308,000	XX	349,000
Total		XX	3,410,000 r	XX	3,440,000	XX	3,760,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

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TABLE 2
CALIFORNIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone[2]	31 r	35,400	$176,000	$4.97	26	27,500	$136,000	$4.94	29	26,300	$124,000	$4.71
Dolomite	5	316	2,390	7.55 r	5	250	1,570	6.30	6	895	4,930	5.50
Marble	2	W	W	8.52	2	W	W	4.71	2	W	W	7.28
Shell	1	W	W	8.18	1	W	W	8.54	1	W	W	8.18
Granite	21 r	12,800	94,700	7.40	21	11,000	87,300	7.92	23	11,400	91,100	7.99
Traprock	26 r	10,900 r	80,000 r	7.34 r	29	10,000	82,900	8.25	34	11,800	102,000	8.70
Sandstone and quartzite	14 r	3,830 r	38,500 r	10.07 r	15	2,140	25,000	11.67	13	1,650	15,900	9.66
Slate	2	W	W	18.80	3	72	1,460	20.18	4	308	3,330	10.81
Volcanic cinder and scoria	8	192	1,690	8.77	8	175	1,640	9.37	8	172	1,970	11.42
Miscellaneous stone	26 r	3,760 r	27,800 r	7.40 r	26	4,280	35,500	8.28	29	2,880	22,000	7.65
Total or average	XX	67,400	423,000	6.28	XX	55,500	371,000	6.69	XX	55,400	365,000	6.60

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quanity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$7.50
Riprap and jetty stone	2,300	$26,100	11.37
Filter stone	259	2,210	8.54
Other coarse aggregates	493	3,590	7.28
Total or average	3,050	31,900	10.47
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,400	13,100	9.34
Bituminous aggregate, coarse	487	6,340	13.01
Bituminous surface-treatment aggregate	(2)	(2)	7.99
Railroad ballast	483	5,110	10.59
Other graded coarse aggregates	2,860	31,400	11.00
Total or average	5,230	56,000	10.71
Fine aggregate (-⅜ inch):			
Stone sand, concrete	195	1,310	6.73
Stone sand, bituminous mix or seal	479	9,030	18.85
Screening, undesignated	558	5,660	10.14
Other fine aggregates	604	9,200	15.24
Total or average	1,840	25,200	13.73
Coarse and fine aggregates:			
Graded road base or subbase	5,290	37,700	7.12
Unpaved road surfacing	250	2,680	10.72
Terrazzo and exposed aggregate	30	470	15.67
Crusher run or fill or waste	1,220	4,100	3.36
Other coarse and fine aggregates	1,540	13,300	8.65
Total or average	8,330	58,300	6.99
Other construction materials	566	6,520	11.53
Agricultural:			
Limestone	(3)	(3)	15.42
Poultry grit and mineral food	(3)	(3)	20.58
Other agricultural uses	174	3,330	19.12
Total or average	174	3,330	19.12
Chemical and metallurgical:			
Cement manufacture	12,000	49,500	4.11
Chemical stone for alkali works	(4)	(4)	6.62
Sulfur oxide removal	(4)	(4)	22.58
Total or average	12,100	49,800	4.12
Special, asphalt fillers or extenders	(5)	(5)	22.04
Other miscellaneous uses:			
Flour (slate)	(6)	(6)	50.71
Other specified uses not listed	258	2,960	11.47
Total or average	258	2,960	11.47
Unspecified:[7]			
Reported	9,720	60,600	6.23
Estimated	14,000	77,000	5.38
Total or average	24,000	137,000	5.73
Grand total or average	55,500	371,000	6.69

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[4]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[5]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[6]Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

[7]Reported and estimated production without a breakdown by end use.

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TABLE 3b

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quanity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	769	$10,500	$13.70
Filter stone	408	3,050	7.47
Other coarse aggregates	1,580	12,000	7.60
Total or average	2,760	25,600	9.28
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,180	11,300	9.59
Bituminous aggregate, coarse	1,620	16,300	10.05
Bituminous surface-treatment aggregate	W	W	8.69
Railroad ballast	437	5,130	11.73
Other graded coarse aggregates	824	5,820	7.06
Total or average	4,070	38,600	9.49
Fine aggregate (-⅜ inch):			
Stone sand, concrete	55	341	6.20
Stone sand, bituminous mix or seal	291	2,600	8.93
Screening, undesignated	1,180	10,400	8.80
Other fine aggregates	219	2,440	11.12
Total or average	1,740	15,700	9.03
Coarse and fine aggregates:			
Graded road base or subbase	4,020	31,000	7.71
Unpaved road surfacing	326	2,370	7.27
Terrazzo and exposed aggregate	46	818	17.78
Crusher run or fill or waste	314	1,230	3.91
Other coarse and fine aggregates	2,340	19,900	8.54
Total or average	7,040	55,400	7.86
Other construction materials[2]	51	542	10.63
Agricultural:			
Limestone	70	746	10.66
Poultry grit and mineral food	119	2,130	17.86
Other agricultural uses	1	9	9.00
Total or average	190	2,880	15.16
Chemical and metallurgical:			
Cement manufacture	7,190	26,600	3.70
Sulfur oxide removal	(3)	(3)	22.05
Glass manufacture	(3)	(3)	6.61
Total or average	7,210	26,700	3.71
Special:			
Asphalt fillers or extenders	(3)	(3)	7.29
Whiting or whiting substitute	(3)	(3)	6.34
Total or average	89	640	7.19
Other miscellaneous uses:			
Flour (slate)	(4)	(4)	50.71
Other specified uses not listed	1,500	8,900	5.94
Total or average	1,500	8,900	5.94
Unspecified:[5]			
Reported	14,900	103,000	6.90
Estimated	16,000	88,000	5.53
Total or average	30,700	190,000	6.20
Grand total or average	55,400	365,000	6.60

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes drain fields.

[3]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[4]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[2]	66	782	20	231	W	W	W	W	54	480
Coarse aggregate, graded[3]	--	--	W	W	W	W	W	W	W	W
Fine aggregate (-¾ inch)[4]	W	W	W	W	355	6,030	W	W	W	W
Coarse and fine aggregate[5]	308	2,460	336	2,950	1,110	8,230	W	W	378	2,590
Other construction materials	--	--	--	--	33	417	381	4,680	9	81
Agricultural[6]	--	--	W	W	--	--	--	--	--	--
Chemical and metallurgical[7]	W	W	W	W	--	--	--	--	--	--
Special[8]	--	--	--	--	(9)	(9)	--	--	--	--
Other miscellaneous uses[10]	14	62	--	--	--	--	--	--	23	1,160
Unspecified:[11]										
Reported	206	1,410	26	152	478	5,470	656	4,020	153	1,000
Estimated	250	1,600	--	--	1,100	6,400	50	280	890	5,300
Total	873	6,600	1,520	9,720	3,240	30,400	3,510	31,100	1,560	11,200

	District 6		District 7		District 8		District 9		District 10	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[2]	W	W	26	368	W	W	603	5,040	W	W
Coarse aggregate, graded[3]	420	6,530	2,190	25,400	W	W	1,060	9,110	--	--
Fine aggregate (-¾ inch)[4]	318	5,630	558	8,530	W	W	101	594	W	W
Coarse and fine aggregate[5]	1,380	10,500	1,890	11,800	W	W	W	W	W	W
Other construction materials	2	26	21	69	--	--	102	1,090	19	164
Agricultural[6]	W	W	W	W	--	--	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W	7,080	26,900	W	W
Special[8]	--	--	--	--	--	--	--	--	(9)	(9)
Other miscellaneous uses[10]	--	--	--	--	17	74	204	1,660	--	--
Unspecified:[11]										
Reported	620	3,760	3,870	21,500	215	1,400	1,810	11,000	520	3,300
Estimated	--	--	120	720	340	2,100	10,000	53,000	470	2,500
Total	2,760	26,700	9,770	75,400	3,860	16,700	22,100	113,000	1,230	9,600

	District 11		District 12		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-¾ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W	--	--
Other construction materials	--	--	--	--	--	--
Agricultural[6]	--	--	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses[10]	--	--	--	--	--	--
Unspecified:[11]						
Reported	862	5,040	346	2,480	8	52
Estimated	470	2,700	310	1,800	--	--
Total	3,800	31,900	1,250	8,900	8	52

See footnotes at end of table.

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TABLE 4a--Continued

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement manufacture, chemical stone for alkali works, and sulfur oxide removal.

[8]Includes asphalt fillers or extenders.

[9]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[10]Includes flour (slate) and other specified uses not listed.

[11]Reported and estimated production without a breakdown by end use.

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TABLE 4b

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[2]	W	W	79	1,110	318	3,620	54	952	W	W
Coarse aggregate, graded[3]	W	W	270	1,840	402	6,490	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	65	412	109	893	W	W	W	W
Coarse and fine aggregate[5]	219	1,840	542	4,170	1,270	9,070	W	W	349	1,770
Other construction materials[6]	--	--	--	--	--	--	--	--	3	12
Agricultural[7]	--	--	W	W	--	--	--	--	--	--
Chemical and metallurgical[8]	W	W	W	W	--	--	--	--	--	--
Special[9]	--	--	--	--	--	--	--	--	--	--
Other miscellaneous uses[10]	2	10	--	--	--	--	--	--	(11)	(11)
Unspecified:[12]										
Reported	22	119	26	152	466	9,640	533	3,230	300	3,110
Estimated	170	1,500	--	--	1,100	7,200	200	1,600	1,000	6,600
Total	791	6,370	1,750	11,800	3,690	36,900	3,200	29,900	1,790	12,300

	District 6		District 7		District 8		District 9		District 10	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	W	W	216	1,400
Coarse aggregate, graded[3]	W	W	W	W	W	W	1,760	13,900	--	--
Fine aggregate (-⅜ inch)[4]	--	--	W	W	W	W	W	W	W	W
Coarse and fine aggregate[5]	941	8,200	181	902	W	W	735	4,310	W	W
Other construction materials[6]	--	--	46	504	--	--	--	--	--	--
Agricultural[7]	W	W	W	W	--	--	W	W	W	W
Chemical and metallurgical[8]	--	--	W	W	W	W	3,420	9,050	W	W
Special[9]	--	--	W	W	--	--	--	--	W	W
Other miscellaneous uses[10]	--	--	482	3,050	--	--	1,020	5,850	--	--
Unspecified:[12]										
Reported	420	2,570	5,430	45,600	48	300	6,130	28,300	280	1,920
Estimated	330	2,000	890	5,300	1,200	4,500	9,700	53,000	260	1,300
Total	2,170	18,500	9,250	71,000	3,620	16,000	23,100	117,000	930	7,410

	District 11		District 12		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	--	--	--	--
Coarse aggregate, graded[3]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[4]	--	--	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W	--	--
Other construction materials[6]	--	--	--	--	--	--
Agricultural[7]	--	--	--	--	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--
Special[9]	--	--	--	--	--	--
Other miscellaneous uses[10]	--	--	--	--	--	--
Unspecified:[12]						
Reported	862	5,040	359	2,730	34	223
Estimated	460	2,700	370	2,200	--	--
Total	2,390	18,400	2,690	19,500	34	223

See footnotes at end of table.

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TABLE 4b--Continued
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[4]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.
[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.
[6]Includes drain fields.
[7]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
[8]Includes cement and glass manufacture and sulfur oxide removal.
[9]Includes asphalt fillers or extenders and whiting or whiting substitute.
[10]Includes flour (slate) and other specified uses not listed.
[11]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."
[12]Reported and estimated production without a breakdown by end use.

TABLE 5a
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	39,100	$329,000	$8.42
Plaster and gunite sands	5,050	44,700	8.87
Concrete products (blocks, bricks, pipe, decorative, etc.)	1,890	16,500	8.71
Asphaltic concrete aggregates and other bituminous mixtures	17,300	146,000	8.41
Road base and coverings	15,200	115,000	7.59
Road and other stabilization (cement and lime)	323	2,890	8.95
Fill	9,830	65,900	6.70
Snow and ice control	49	340	6.88
Other miscellaneous uses[2]	453	5,560	12.27
Unspecified:[3]			
Reported	46,100	299,000	6.48
Estimated	17,000	120,000	7.30
Total or average	152,000	1,150,000	7.54

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 5b
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	47,200	$385,000	$8.17
Plaster and gunite sands	6,110	63,500	10.40
Concrete products (blocks, bricks, pipe, decorative, etc.)	1,220	10,600	8.71
Asphaltic concrete aggregates and other bituminous mixtures	18,200	160,000	8.75
Road base and coverings	15,000	115,000	7.66
Road and other stabilization (cement and lime)	624	6,530	10.46
Fill	6,820	29,400	4.31
Snow and ice control	72	521	7.27
Railroad ballast	28	142	4.99
Other miscellaneous uses[2]	885	13,900	15.70
Unspecified:[3]			
Reported	43,800	302,000	6.90
Estimated	26,000	200,000	7.62
Total or average	166,000	1,280,000	7.74

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	817	9,770	730	6,080	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	447	3,240	W	W
Road base and coverings[3]	342	2,690	713	3,890	85	1,000
Fill	3	32	20	135	206	2,210
Other miscellaneous uses[4]	57	747	20	145	787	9,600
Unspecified:[5]						
Reported	232	1,380	387	3,180	14	113
Estimated	1,000	10,000	400	2,700	370	3,300
Total	2,450	24,600	2,720	19,400	1,460	16,200

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	7,680	59,900	417	3,190	2,150	26,700
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	4,830	43,800	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	4,710	39,300	W	W	1,070	12,200
Road base and coverings[3]	6,430	51,400	797	5,730	931	8,390
Fill	1,220	7,300	359	2,180	2,190	26,600
Other miscellaneous uses[4]	128	1,190	176	1,520	--	--
Unspecified:[5]						
Reported	6,700	50,200	160	1,280	1,310	11,600
Estimated	1,500	11,000	1,800	13,000	600	4,100
Total	33,200	264,000	3,710	26,900	8,250	89,600

	District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,270	11,500	6,220	49,900	4,450	28,700
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	155	1,660	1,320	9,250
Asphaltic concrete aggregates and other bituminous mixtures	W	W	1,820	16,700	4,450	26,400
Road base and coverings[3]	W	W	1,740	12,700	2,120	12,000
Fill	796	4,810	346	2,510	724	1,900
Other miscellaneous uses[4]	374	4,900	105	2,580	46	531
Unspecified:[5]						
Reported	793	5,280	2,990	21,000	19,100	120,000
Estimated	80	560	1,100	7,000	2,800	20,000
Total	3,310	27,100	14,500	114,000	35,000	219,000

	District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	W	W	11,800	95,500	2,200	24,400
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	82	847	360	3,410	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	W	W
Road base and coverings[3]	739	6,090	W	W	867	6,630
Fill	516	2,870	1,650	6,310	1,800	9,060
Other miscellaneous uses[4]	465	5,270	2,580	22,700	1,480	15,500
Unspecified:[5]						
Reported	2,150	14,000	6,900	41,000	4,060	25,800
Estimated	110	750	5,500	40,000	1,300	9,000
Total	4,900	37,600	29,300	214,000	11,700	90,400

	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings[3]	--	--
Fill	--	--
Other miscellaneous uses[4]	--	--

See footnotes at end of table.

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TABLE 6a--Continued

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Unspecified:[5]						
Reported	1,350	3,960				
Estimated	--	--				
Total	1,350	3,960				

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes railroad ballast and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	56	453	464	3,840	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	404	4,290	W	W
Road base and coverings[3]	98	838	781	5,780	W	W
Fill	6	44	22	150	55	337
Other miscellaneous uses[4]	28	229	41	333	412	5,150
Unspecified:[5]						
Reported	243	1,540	18	165	561	5,910
Estimated	750	8,300	750	4,200	190	1,500
Total	1,180	11,400	2,480	18,800	1,220	12,900
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	7,470	60,800	302	2,450	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	3,470	34,400	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	5,780	53,600	W	W	W	W
Road base and coverings[3]	6,270	52,000	758	5,740	W	W
Fill	929	5,420	307	2,520	505	2,770
Other miscellaneous uses[4]	542	8,210	229	1,920	4,370	51,100
Unspecified:[5]						
Reported	9,880	75,500	18	131	2,170	17,500
Estimated	800	6,200	1,100	7,800	3,300	34,000
Total	35,100	296,000	2,690	20,500	10,300	106,000
	District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	663	6,460	6,170	53,200	13,500	91,200
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	190	2,300	2,090	19,700
Asphaltic concrete aggregates and other bituminous mixtures	--	--	2,470	21,300	4,780	36,000
Road base and coverings[3]	--	--	1,790	14,200	2,650	16,800
Fill	52	451	112	811	1,260	4,330
Other miscellaneous uses[4]	477	5,860	112	2,920	28	142
Unspecified:[5]						
Reported	347	2,280	1,220	7,970	15,700	106,000
Estimated	490	3,400	3,500	24,000	6,200	42,000
Total	2,030	18,500	15,600	127,000	46,300	316,000
	District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	W	W	13,300	103,000	2,610	29,400
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	1,050	10,400	W	W
Asphaltic concrete aggregates and other bituminous mixtures	--	--	2,640	20,600	W	W
Road base and coverings[3]	174	849	1,020	6,660	820	6,690
Fill	66	429	2,260	8,780	1,240	3,380
Other miscellaneous uses[4]	120	1,450	3	9	1,230	14,400
Unspecified:[5]						
Reported	6,810	46,800	5,470	34,600	81	640
Estimated	2,400	20,000	5,000	35,000	1,400	9,600
Total	9,600	69,600	30,700	220,000	7,350	64,200
	Unspecified districts					
	Quantity	Value				
Concrete aggregate (including concrete sand)	--	--				
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--				
Asphaltic concrete aggregates and other bituminous mixtures	--	--				
Road base and coverings[3]	--	--				
Fill	--	--				
Other miscellaneous uses[4]	--	--				

See footnotes at end of table.

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TABLE 6b--Continued

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Unspecified:[5]						
Reported	1,270	3,280				
Estimated	--	--				
Total	1,270	3,280				

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration, railroad ballast, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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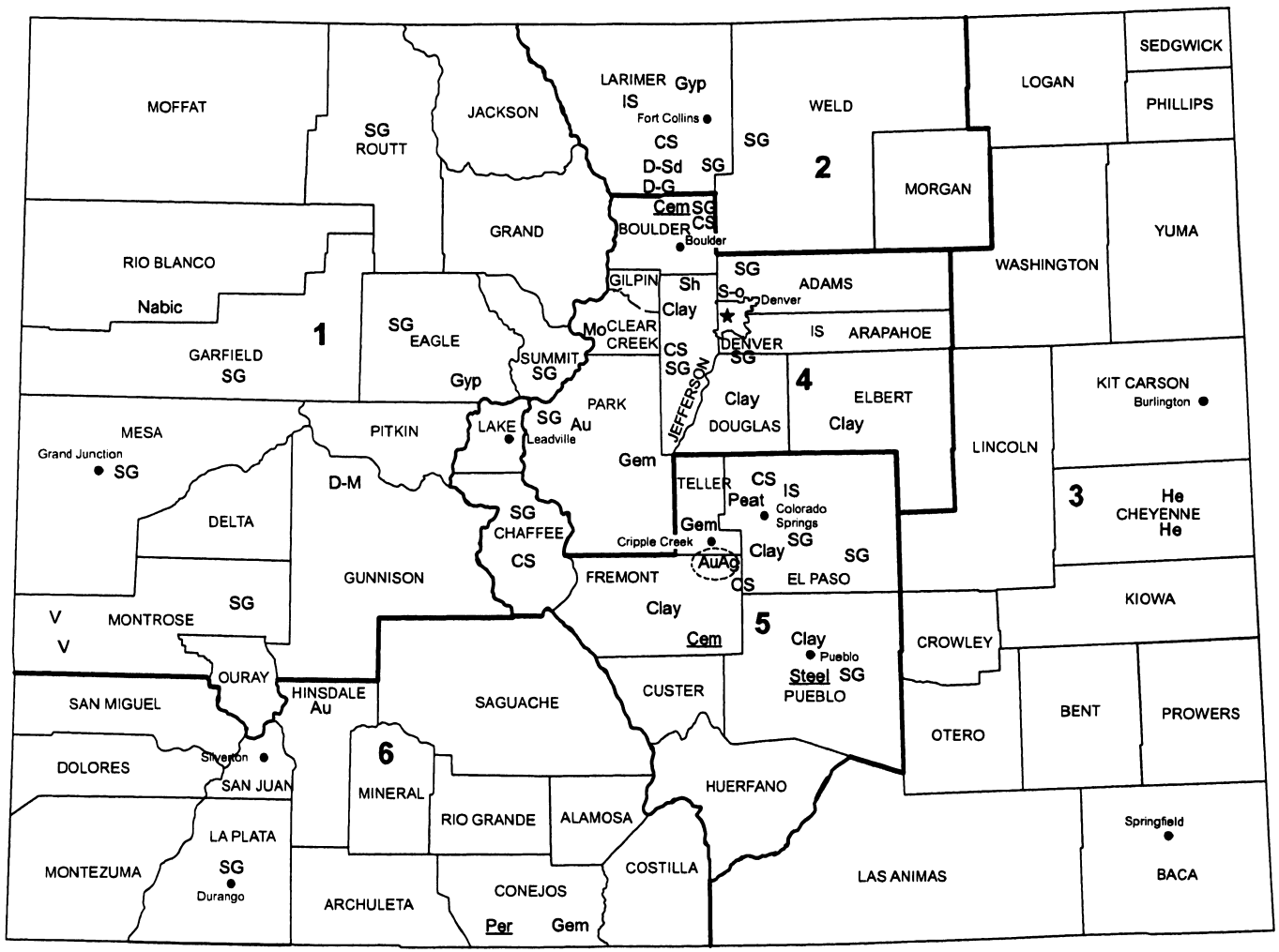

LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-M	Dimension marble
D-Sd	Dimension sandstone
Gem	Gemstones
Gyp	Gypsum
He	Helium
IS	Industrial sand
Mo	Molybdenum
Nabic	Sodium bicarbonate
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Sh	Shale
Steel	Steel plant
V	Vanadium
	Concentration of mineral operations

0 100 Kilometers

Source: Colorado Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 2004, Colorado's nonfuel raw mineral production was valued[1] at $1.01 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 50% increase from that of 2003[2] and followed a 6.2% increase from 2002 to 2003. The State increased to 17th from 22d in rank among the 50 States in nonfuel mineral production value, of which Colorado accounted for more than 2% of the U.S. total.

The State's two leading nonfuel mineral commodities in 2004, by value, were molybdenum concentrates and construction sand and gravel, followed by portland cement, gold, and crushed stone. A large part of Colorado's substantial increase in value in 2004 was a result of the increased production and value of molybdenum concentrates, as well as those of gold (value up about $23 million), construction sand and gravel (up $22 million), and cement (up about $17 million for masonry and portland combined); and a smaller yet significant increase in crushed stone (up more than $3 million) (table 1). The only substantial decrease in value was from that of soda ash, down slightly more than $25 million.

Nearly 52% of Colorado's nonfuel mineral production value in 2004 resulted from the production of metals—molybdenum concentrates, gold, and silver—in descending order of value; this was a significant increase from 30% in 2003 and 23% in 2002. Molybdenum concentrate production rose by more than 25% in 2004, and its total production value more than quadrupled that of 2003 as the significant growth in molybdenum concentrate prices that began in December 2002 continued on throughout 2003 and 2004. For example, the time-average price of molybdic oxide rose from $8.27 per kilogram in 2002 to $11.75 per kilogram in 2003 to $36.73 per kilogram in 2004 and reached $68.86 in December 2004. Molybdenum concentrate prices remained high and continued to increase more gradually during the early months of 2005. (Prices were converted from those reported in Platts Metals Week in dollars per pound of contained molybdenum).

In 2003, Colorado's rise in mineral production value was led by increases in the production and related value of gold, molybdenum concentrates, and portland cement, up about $32 million, $22 million, and $21 million, respectively. Additionally, an increase of nearly $4 million also took place in soda ash. The most significant decreases in production and values took place in crushed stone and construction sand and gravel. The value of crushed stone was down $32 million (down 33%) with a dropoff in production of 30.7%, and construction sand and gravel value was down $9 million (down 4%) with a dropoff in production of nearly 8%. Relative to these, most other nonfuel minerals showed significantly smaller changes in value, for the most part small increases, that were inconsequential to the net result for the year (table 1).

In 2004, Colorado remained second in the quantity of molybdenum concentrates produced among 6 producing States, third of 3 States that produce soda ash, and ninth in gemstones (based on value). The State rose to 4th from 5th of 10 gold-producing States and to 9th from 10th in gypsum and decreased to 10th from 8th in silver and to 10th from 9th in construction sand and gravel. Additionally, Colorado produced significant quantities of portland cement and common clays.

The following narrative information was provided by the Colorado Geological Survey[3] (CGS) and much of the data are based on its own surveys, estimates, and information gathered from company annual reports.

Exploration and Development Activities

Mineral exploration and development activity increased in 2004. The number of active, unpatented mining claims on public lands in Colorado has been declining since 1994, but in 2004 there was a modest increase (Cappa and others, 2005, p. 28). Various groups conducted exploration activities for copper, gold, silver, and uranium.

The Cashin copper deposit in Montrose County is a sandstone-hosted deposit near the Colorado-Utah border that is currently being explored and developed by Constellation Copper Corp. The deposit was explored as a potential satellite operation to the Constellation's new Lisbon Valley Mine, 24 kilometers (km) to the southwest in San Juan County, UT. Pending further engineering studies, permitting, and resource definition, copper ore from Cashin will be trucked to Lisbon Valley for processing. New estimates based on revised relogging of older drill holes and new drilling indicated a resource of 9.5 million metric tons (Mt) grading 0.52% copper, which contains about 49,000 metric tons (t) of copper. Proven and probable mining reserves, calculated at the copper price of $2.09 per kilogram, are estimated to be 4.76 Mt grading 0.52% copper with a waste-to-ore ratio of 0.74 to 1.

Calais Resources, Inc. continued exploration and resource-definition drilling in the historic Caribou District in Boulder County. The company drilled 2,700 meters (m) of core in four deep holes in 2004. Specific targets of the drilling included the northeast-striking No Name vein system and the contact zone between the Caribou monzonite stock and Proterozoic gneiss.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]John W. Keller, a Geologist at the Colorado Geological Survey, authored the text of the State mineral industry information provided by that agency.

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Drill holes successfully intersected mineralization in the No Name vein system. The Nelson veins were also intersected, and four previously undiscovered veins were also found below the footwall of the No Name vein. One of the mineralized intercepts contained 18.5 grams per metric ton (g/t) gold over 0.6 m and was 602 m below the surface and was the deepest mineralization tested so far in the Caribou District. Several other intercepts of 10 to 31 g/t gold were encountered as well, and these ranged from 0.8 m to 1.8 m in width.

Consolidated Global Minerals Ltd. of Vancouver, British Columbia, Canada, announced in September 2004 that it had purchased an underground drill, a surface exploration drilling rig, and mining equipment needed for the exploration of the Cash Mine and other areas in the Gold Hill District in Boulder County. The project was called "The Front Range Gold JV." They announced that several drill holes had been completed and one was in progress. Assays from 11 rock chip samples from the 38 m level at the Cash Mine averaged 55 g/t gold and 272 g/t silver. Work was done to retune the circuits at the 45-metric-ton-per-day flotation mill, which was built in 1987 and operated briefly in 1988. Historic mines in the area produced gold and silver from narrow, high-grade quartz veins in Proterozoic gneiss and granitic rocks.

The Bates-Hunter Mine in Central City, Gilpin County, saw renewed activity in late 2004. In September, Wits Basin Precious Metals, Inc., a Minneapolis-based junior exploration company, secured an option to purchase the Bates-Hunter Mine and The Golden Gilpin Mill. Central City Consolidated Mining Company is the present owner of the mine and mill, which has not produced ore since 1936 according to press releases from Wits Basin. The mine produced gold from ore shoots in steeply dipping fissure veins. Wits Basin recently announced plans to dewater and rehabilitate the shaft, to conduct exploration drilling from underground stations when the workings are rehabilitated, and to refurbish the Golden Gilpin Mill.

In 2004, Minerex Corp. applied for permits from the State of Colorado and Teller County for the Little Hope Mine, a proposed small, underground gold mine near Mineral Hill just north of the town of Cripple Creek. The mine would produce gold ore that would be processed at a custom mill located elsewhere.

Commodity Review

Industrial Minerals

Cement.—Holcim (US) Inc. and CEMEX, Inc. produced a combined 2.6 Mt of cement in 2004. Holcim's plant near Florence, CO, employed about 180 people and operated at capacity to produce about 1.9 Mt of portland cement. The CEMEX plant near Lyons, Colorado, employed about 100 people and produced portland and masonry cement. Cement production was 460,000 t, most of which was utilized in the greater metropolitan Denver area.

Clay and Shale.—The majority of the clay mined in Colorado was common clay, which was used mainly to make bricks and tiles or in the manufacture of cement and lightweight aggregate. Common clay was mined primarily in eastern Colorado, especially near the Front Range in Douglas, El Paso, Elbert, Fremont, Jefferson, and Pueblo Counties. In 2004, Colorado clay mines produced 262,000 t of clay, which represents an increase of about 1% more than that of 2003. The value of this clay was estimated to be more than $1.4 million. In eastern Colorado, clay is mined principally from the Laramie Formation (Upper Cretaceous), the Dakota Sandstone (Lower Cretaceous), and the Dawson Formation (Upper Cretaceous to Tertiary). Principal producers of clay products are located in the Front Range area and include Denver Brick Co., Robinson Brick Co., Summit Brick and Tile, Co., and TXI Operations (Texas Industries, Inc.).

Crushed Stone and Sand and Gravel.—The production of construction materials and many industrial minerals is largely tied to the health of the construction industry. Increased demand for aggregate was expected in 2005 as the Colorado economy strengthened and construction continued on the Interstate 25 transportation project and other major roadways in the State.

In 2004, about 70,000 t of industrial sand and gravel worth about $3.0 million was produced in the State, which is roughly the same amount produced in 2003. Colorado's leading industrial sand company is the Ohio-based Oglebay Norton Co. that markets "Colorado Silica Sand," a specialty industrial sand used primarily as filter media for water purification plants and as a construction material, largely for stucco. Oglebay Norton quarries and receives raw material from Quaternary eolian deposits consisting mostly of well-sorted and well-rounded grains of quartz.

Dimension Stone.—Colorado produced 5,240 t of dimension stone in 2004 with an estimated value of $1.5 million. This is a 13% increase compared with the 2003 production. The principal Colorado dimension stones include granite, marble, rhyolite, and sandstone. Improvements in quarry techniques and rising costs of some other construction materials has lead to renewed interest in the use of stone as a building material, particularly in residential markets.

Significant dimension stone mines in Colorado include the Yule Marble quarry in Marble, which was sold by Sierra Minerals in April 2004 to Colorado Stone Quarries (CSQ) (a subsidiary of Polycor, Inc. of Quebec, Ontario, Canada). CSQ brought in an experienced operating manager and more modern quarrying equipment that, together, resulted in significantly expanded production in the latter portion of 2004 and into 2005. Downtime during the sale of the quarry, however, resulted in a net production of 1,700 t, down 11% from 2003. The Yule Marble is Colorado's official State rock.

Arkins Park Stone Corporation employed about 40 people and operates three quarries near the town of Masonville in Larimer County. The company produces buff-colored sandstone as well as "Berthoud Pink" and "Berthoud Sunset" from the Permian Lyons Sandstone. Much of the stone is used as flagstone and facing in the construction of buildings. Recently, the company also began producing riprap for commercial uses such as bridge abutments, dams, and riverbed linings.

Other important dimension and decorative producers include several quarries in Boulder and Larimer Counties that fabricate

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facing and decorative stone from the Permian Lyons Sandstone. The Eocene Wall Mountain Tuff is quarried near Castle Rock and is fabricated as dimension stone and riprap.

Gypsum.—The American Gypsum Co.'s mine and wallboard plant, located near the town of Gypsum, produced 562,000 t of gypsum in 2004. This represented a 5% production increase from 2003. Approximately 56 million square meters per year of wallboard are manufactured at the plant. About one-half of the wallboard was used by the Colorado construction industry, and the remainder was marketed throughout the United States. The gypsum was excavated from evaporite deposits in the Pennsylvanian Eagle Valley Formation using a pavement grinder. American Gypsum was developing a new mining area northeast of the current site. For a span of a few years, mining will shift to the new site as reserves are depleted in the original site. The plant and mine employed approximately 120 people.

Colorado Lien (subsidiary of Pete Lien & Sons, Inc. of South Dakota) produced gypsum from the Munroe Quarry north of Fort Collins near Livermore. Gypsum was extracted from the Permian Lykins Formation using a portable crusher. Annual production averaged about 23,000 t. The majority of the material quarried was sold within the State to the cement industry.

Soda Ash.—Natural Soda, Inc. produced sodium bicarbonate (baking soda) derived from nahcolite that was solution mined in the Piceance Basin in northwestern Colorado. In 2004, the plant produced 72,000 t of sodium bicarbonate, a 2.4% increase more than the 70,300 t produced in 2003. Prices for sodium bicarbonate remained stable in 2004. High-grade nahcolite (greater than 80%) is recovered from the Boise Bed of the Green River Formation. Food-grade and industrial-grade products were marketed.

American Soda (owned by Solvay Chemicals, Inc.) mothballed its large nahcolite solution mine and soda ash processing plant in northwestern Colorado in spring 2004, layingoff approximately 50 people. The processing plant in Garfield County had manufactured soda ash and sodium bicarbonate from nahcolite, which was solution mined in Rio Blanco County. The plant still produced sodium bicarbonate using feedstock railed to Parachute from Solvay's trona mine in Wyoming.

Metals

Gold and Silver.—Cripple Creek & Victor Gold Mining Co. (CC&V) (a subsidiary of South African-based AngloGold Ashanti, Ltd.) operated the Cresson Mine (Teller County), which was the leading producer of precious metals in Colorado and the 9th ranked U.S. gold mine. The mine produced 10,200 kilograms (kg) of gold in 2004, up 16% from the quantity produced in 2003. The average grade of ore mined was 0.86 g/t gold. Based on AngloGold's realized sales prices of gold produced at the CC&V Mine, the value of gold produced at the mine was $105 million in 2004. More than 6,190 kg of silver, valued at approximately $1.3 million, was also produced. AngloGold expects the mine to produce approximately 10,300 kg of gold in 2005. In 2004, CC&V received county and State approval for an extension of the East Cresson mining area. This extension will provide approximately 5 Mt of additional ore. The mine employs approximately 318 people and is the largest private employer in Teller County.

LKA International, Inc. owns the Golden Wonder, a small, high-grade underground gold mine near Lake City in the San Juan Mountains. Since beginning operations in 1998, the mine has produced more than 2,950 kg of gold. The 2004 production was 445 kg of gold. According to company press releases, the weighted average grade of ore mined during the past 2 years was 523 g/t gold. In January 2005, LKA announced that it is planning to permit and develop a new adit and drift below the current workings. The proposed drift will be located approximately 300 m below the deepest current workings.

Molybdenum.—The price of molybdenum skyrocketed from nearly $8 per pound at the end of 2003 to more than $30 per pound in early 2005. Because of the high price and increased production, molybdenum is now the largest segment of Colorado's nonfuel minerals industry in terms of production value (Cappa and others, 2004, p. 31). The Henderson Mine in the Front Range west of Idaho Springs added a work shift and significantly increased molybdenum production in 2004. Climax Molybdenum Company (a subsidiary of Phelps Dodge) operates the underground block-cave mine. Henderson is North America's leading primary producer of molybdenum. In 2004, the mine produced 12,500 t of molybdenum metal contained in concentrates, a 24% increase compared with the quantity produced in 2003. The estimated production value was $348 million. Phelps Dodge reported that it received an average of $12.65 per pound for molybdenum produced in 2004. In 2005, Henderson expects to again increase production to 14,100 t. The mine and mill employs 485 workers. Henderson is currently developing the new 2,200-m production level, which is expected to produce at a rate of 18,100 metric tons per year by mid-2006. Reserves at yearend 2004 were 144 Mt with a grade of 0.21% molybdenum.

The Climax Mine, also owned by Phelps Dodge, was the first major molybdenum mine in the Unied States. The mine is located on the Continental Divide at Fremont Pass between Leadville and Copper Mountain. The mine has been on care-and-maintenance status since 1995. Phelps Dodge reports that at yearend 2004, Climax still contained millable reserves of 144 Mt of ore grading 0.19% molybdenum. High molybdenum prices and projections have prompted Phelps Dodge to evaluate the economic viability of startingup mining operations at Climax for short- and mid-term production.

Vanadium.—Colorado is the only State currently producing vanadium ore. Vanadium, a metal used to harden steel, is a coproduct of uranium at the recently opened Cotter Corp. mines in Montrose County. Although these mines are known mainly for their production of uranium, they actually produce more vanadium by volume than uranium. In 2004, Cotter's mines produced 13,800 t of ore containing at least 128 t of vanadium. The USGS reports that average prices for vanadium more than doubled in 2004, averaging $5.28 per pound compared with $2.21 per pound in 2003 and $1.34 in 2002 (Magyar, 2005). Cotter expects to achieve a production of 73,000 t of ore in 2005 and 130,000 t in 2006. Ore grades are expected to be 1.84% vanadium oxide.

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Government Programs

The CGS is working cooperatively with the USGS to upgrade the Colorado portion of the Mineral Resources Data System (MRDS), a comprehensive national computer database of nonfuel mineral mines and mineral occurrences. CGS continues to produce new reports on the geology and mineral resources of Colorado counties. Each report contains geologic and mineral resource maps. In 2004, progress was made on the reports for Chaffee, Lake, and Saguache Counties. Also in 2004, CGS completed seven new 1:24,000-scale geologic maps as part of the STATEMAP component of the National Cooperative Geologic Mapping Program. A complete listing of publications available from CGS is available on the internet at http://geosurvey.state.co.us/.

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Magyar, M.J., 2005, Vanadium: U.S. Geological Survey Mineral Commodity Summaries 2005, p. 182-183.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	W	W	W	W	5	W
Common	214	1,260	259	1,580	249	1,510
Gemstones	NA	269	NA	281	NA	360
Lime	20	1,250	26	2,330	26	2,570
Sand and gravel:						
Construction	40,700	222,000	37,500	213,000	40,900	235,000
Industrial	61	W	70	W	W	3,300
Stone:						
Crushed	15,000	96,000	10,400	64,000	11,000	67,300
Dimension	18	2,400	5	1,610	16	1,980
Combined values of cement, gold, gypsum (crude), helium (Grade-A), molybdenum concentrates, silver, soda ash, and values indicated by symbol W	XX	312,000 r	XX	391,000	XX	699,000
Total	XX	634,000	XX	673,000	XX	1,010,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
COLORADO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	11	4,620	$30,900	$6.68	6	1,920	$12,000	$6.27	6	1,800	$10,800	$6.02
Dolomite	1	W	W	4.63	1	W	W	4.63	1	W	W	4.63
Marble	--	--	--	--	--	--	--	--	1	W	W	8.17
Granite	8 r	6,720 r	45,000 r	6.70 r	9	4,960	32,200	6.48	9	5,230	33,900	6.48
Sandstone and quartzite	9	2,770	16,100	5.82	6	2,870	16,400	5.71	5	3,210	18,400	5.72
Volcanic cinder and scoria	2 r	W	W	5.67 r	2	W	W	7.62	3	W	W	6.32
Miscellaneous stone	10 r	629 r	2,790 r	4.43 r	6	457	2,450	5.35	7	557	2,970	5.32
Total or average	XX	15,000	96,000	6.42	XX	10,400	64,000	6.18	XX	11,000	67,300	6.12

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a
COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.51
Riprap and jetty stone	349	$3,530	10.12
Filter stone	W	W	8.37
Other coarse aggregates	479	2,670	5.57
Total or average	828	6,200	7.49
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	7.72
Bituminous aggregate, coarse	872	6,680	7.66
Bituminous surface-treatment aggregate	(2)	(2)	4.13
Railroad ballast	(2)	(2)	12.12
Total or average	1,280	10,100	7.86
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	736	2,690	3.66
Screening, undesignated	(3)	(3)	2.11
Other fine aggregates	11	21	1.91
Total or average	747	2,710	3.63
Coarse and fine aggregates:			
Graded road base or subbase	357	1,370	3.82
Unpaved road surfacing	(2)	(2)	5.26
Crusher run or fill or waste	(2)	(2)	0.55
Total or average	445	1,430	3.21
Other construction materials	194	1,590	8.21
Agricultural:			
Limestone	(4)	(4)	27.56
Poultry grit and mineral food	(4)	(4)	35.27
Chemical and metallurgical, sulfur oxide removal	(4)	(4)	15.06
Special, mine dusting or acid water treatment	(4)	(4)	35.33
Other miscellaneous uses and specified uses not listed	54	246	4.56
Unspecified:[5]			
Reported	6,360	39,100	6.15
Estimated	440	2,600	6.00
Total or average	6,800	41,800	6.14
Grand total or average	10,400	64,000	6.18

W Withheld to avoid disclosing company proprietary data; included in "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[4]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 3b
COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	323	$3,660	$11.34
Filter stone	W	W	9.09
Other coarse aggregates	261	2,020	7.74
Total or average	584	5,680	9.73
Coarse aggregate, graded:			
Bituminous aggregate, coarse	945	7,530	7.97
Bituminous surface-treatment aggregate	(2)	(2)	7.50
Total or average	945	7,530	7.97
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	4.45
Stone sand, bituminous mix or seal	674	2,250	3.35
Screening, undesignated	(3)	(3)	2.99
Total or average	951	3,470	3.65
Coarse and fine aggregates:			
Graded road base or subbase	259	970	3.75
Unpaved road surfacing	(4)	(4)	4.61
Crusher run or fill or waste	(4)	(4)	3.55
Other coarse and fine aggregates	705	3,720	5.27
Total or average	964	4,690	4.86
Chemical and metallurgical, cement manufacture	(2)	(2)	6.18
Special, mine dusting or acid water treatment	(2)	(2)	3.33
Other miscellaneous uses and specified uses not listed	64	635	9.92
Unspecified:[5]			
Reported	4,060	22,400	5.52
Estimated	2,900	19,000	6.78
Total or average	6,930	41,800	6.04
Grand total or average	11,000	67,300	6.12

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[3]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	W	W	--	--	W	W
Coarse and fine aggregate[6]	W	W	--	--	W	W
Other construction materials	--	--	--	--	91	745
Agricultural[7]	--	--	--	--	--	--
Chemical and metallurgical[9]	(8)	(8)	--	--	--	--
Special[10]	--	--	--	--	--	--
Other miscellaneous use[11]	--	--	--	--	7	33
Unspecified:[12]						
Reported	381	2,400	--	--	4,830	29,200
Estimated	30	160	360	2,200	30	170
Total	476	3,160	360	2,200	6,940	42,100

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	665	4,610	--	--	--	--
Coarse aggregate, graded[4]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[5]	W	W	--	--	--	--
Coarse and fine aggregate[6]	W	W	41	158	--	--
Other construction materials	103	847	--	--	--	--
Agricultural[7]	(8)	(8)	--	--	--	--
Chemical and metallurgical[9]	--	--	--	--	--	--
Special[10]	(8)	(8)	--	--	--	--
Other miscellaneous use[11]	46	213	--	--	--	--
Unspecified:[12]						
Reported	1,150	7,440	--	--	9	54
Estimated	20	100	--	--	--	--
Total	2,530	16,300	41	158	9	54

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No production for District 3.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and railroad ballast.

[5]Includes stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregates.

[6]Includes crusher run (select material or fill), graded road base or subbase, and unpaved road surfacing.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[9]Includes sulfur oxide removal.

[10]Includes mine dusting or acid water treatment.

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TABLE 4b

COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	W	W
Coarse and fine aggregate[6]	W	W	--	--	W	W
Chemical and metallurgical[7]	--	--	--	--	W	W
Special[8]	--	--	--	--	--	--
Other miscellaneous use[9]	64	635	--	--	--	--
Unspecified:[10]						
Reported	404	2,230	--	--	2,690	14,800
Estimated	56	330	360	2,200	2,400	17,000
Total	607	3,790	360	2,200	7,210	44,500

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	--	--	--	--
Coarse aggregate, graded[4]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[5]	W	W	--	--	--	--
Coarse and fine aggregate[6]	W	W	30	139	--	--
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	W	W	--	--	--	--
Other miscellaneous use[9]	--	--	--	--	--	--
Unspecified:[10]						
Reported	937	5,170	--	--	26	161
Estimated	28	110	--	--	--	--
Total	2,770	16,500	30	139	26	161

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No production for District 3.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse) and bituminous surface-treatment aggregate.

[5]Includes stone sand (bituminous mix or seal), stone sand (concrete), and screening (undesignated).

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes cement manufacture.

[8]Includes mine dusting or acid water treatment.

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TABLE 5a
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,070	$25,800	$6.33
Plaster and gunite sands	98	804	8.24
Concrete products (blocks, bricks, pipe, decorative, etc.)	118	963	8.17
Asphaltic concrete aggregates and other bituminous mixtures	2,450	16,200	6.61
Road base and coverings[2]	6,410	32,200	5.03
Fill	879	3,460	3.93
Snow and ice control	112	712	6.34
Other miscellaneous uses[3]	137	1,650	12.06
Unspecified:[4]			
Reported	12,400	64,400	5.20
Estimated	11,000	66,000	6.11
Total or average	37,500	213,000	5.67

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,690	$32,600	$6.96
Plaster and gunite sands	35	360	10.15
Concrete products (blocks, bricks, pipe, decorative, etc.)	126	676	5.36
Asphaltic concrete aggregates and other bituminous mixtures	2,010	14,700	7.35
Road base and coverings[2]	6,350	31,500	4.96
Fill	1,330	5,380	4.04
Snow and ice control	73	528	7.23
Railroad ballast	151	1,860	12.36
Other miscellaneous uses[3]	282	2,510	8.89
Unspecified:[4]			
Reported	12,500	65,300	5.22
Estimated	13,000	79,000	5.97
Total or average	40,900	235,000	5.75

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes roofing granules and filtration.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a

COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	552	4,300	1,510	9,110	64	349
Plaster and gunite sands	13	110	W	W	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	--	--	--	--
Asphaltic concrete aggregates and other bituminous mixtures	320	2,520	W	W	770	4,760
Road base and coverings[2]	1,780	8,720	905	6720	429	2,440
Fill	400	1,980	196	717	9	12
Snow and ice control	10	73	--	--	--	--
Other miscellaneous uses[3]	16	224	268	1,190	--	--
Unspecified:[4]						
Reported	3,990	21,700	3,270	16,600	248	1,290
Estimated	970	5,500	3,600	18,000	190	700
Total	8,050	45,100	9,700	52,500	1,710	9,550

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	526	3,270	1,150	6,760	265	1,990
Plaster and gunite sands	W	W	16	156	2	13
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	106	846	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	653	5,540
Road base and coverings[2]	585	1,720	1,450	5,210	1,260	7,390
Fill	169	462	79	172	26	112
Snow and ice control	W	W	47	247	52	357
Other miscellaneous uses[3]	333	2,270	296	1,820	15	229
Unspecified:[4]						
Reported	2,450	12,800	1,720	8,950	577	2,930
Estimated	4,700	35,000	1,300	6,100	220	1,100
Total	8,720	55,300	6,140	30,200	3,070	19,600

	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	--	--
Plaster and gunite sands	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings[2]	--	--
Fill	--	--
Snow and ice control	--	--
Other miscellaneous uses[3]	--	--
Unspecified:[4]		
Reported	123	204
Estimated	--	--
Total	123	204

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road and other stabilization (cement and lime).

[3]Includes railroad ballast.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 6b

COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	828	6,490	1,180	7,480	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	18	177	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	614	5,800	W	W	W	W
Road base and coverings[3]	1,850	9,800	1,090	7,430	545	1,800
Fill	284	1,560	698	2,770	1	2
Other miscellaneous uses[4]	41	410	244	1,110	438	2,340
Unspecified:[5]						
Reported	761	4,230	5,810	30,100	213	1,180
Estimated	2,200	14,000	3,800	20,000	840	4,600
Total	6,610	42,100	12,900	69,200	2,040	9,930

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,170	9,410	975	5,450	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	69	477	W	W
Asphaltic concrete aggregates and other bituminous mixtures	375	2,320	W	W	W	W
Road base and coverings[3]	389	1,090	1,150	3,930	1,330	7,430
Fill	188	601	123	302	37	151
Other miscellaneous uses[4]	369	3,200	237	1,890	809	6,770
Unspecified:[5]						
Reported	2,350	12,800	1,700	9,380	1,270	7,000
Estimated	4,400	30,000	1,400	6,700	620	4,100
Total	9,210	59,500	5,660	28,100	4,070	25,400

	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings[3]	--	--
Fill	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	414	684
Estimated	--	--
Total	414	684

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration, railroad ballast, roofing granules, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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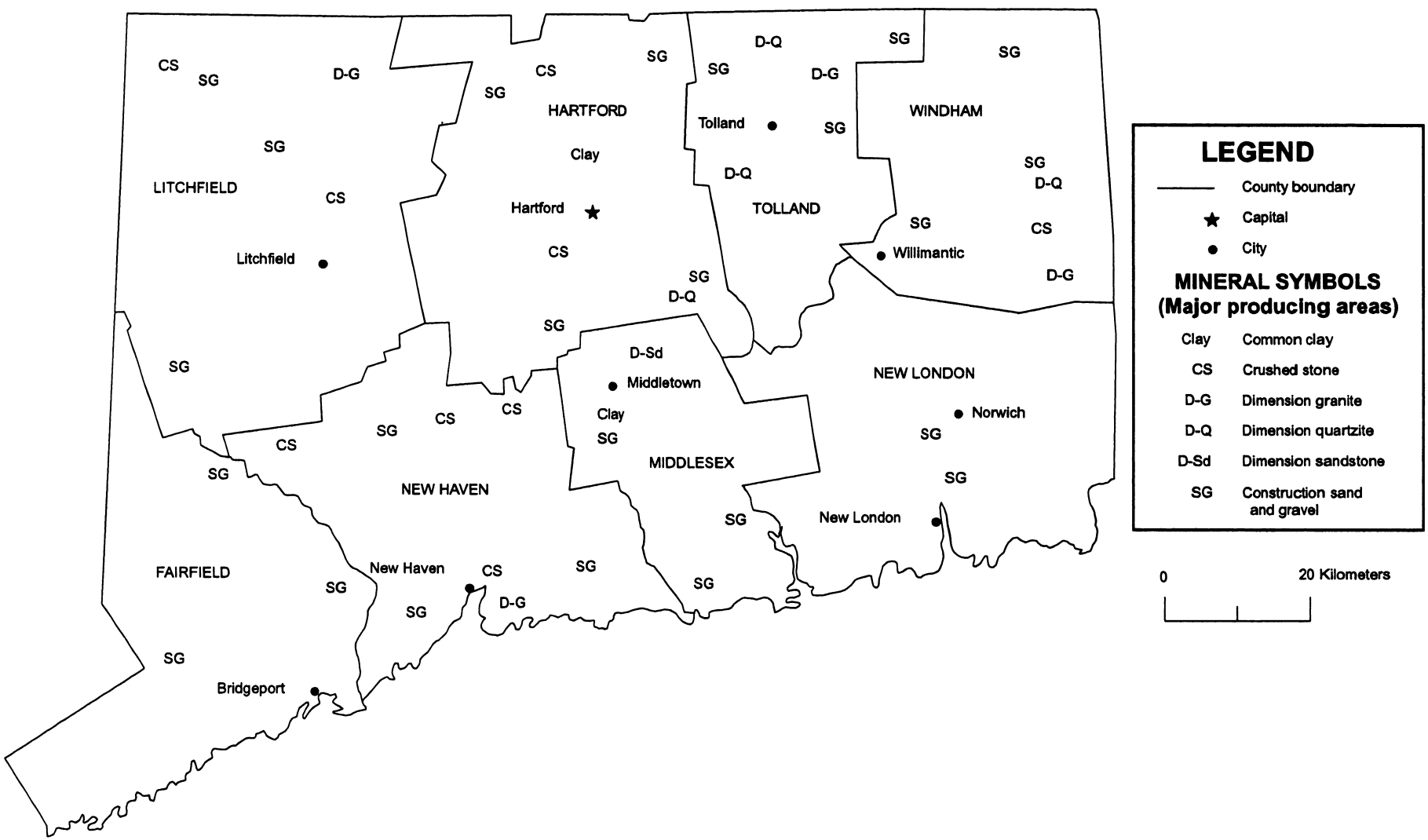
CONNECTICUT



Source: Connecticut Geological and Natural History Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF CONNECTICUT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Connecticut Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 2004, Connecticut's nonfuel raw mineral production was valued[1] at about $131 million, based upon annual U.S. Geological Survey (USGS) data. This was a 1.5% decrease compared with that of 2003[2] and followed a 6.4% increase from 2002 to 2003. Because data for dimension stone (quartzite) were withheld to protect company proprietary data, the actual total values for 2002-04 are higher than those reported in table 1.

Crushed stone and construction sand and gravel, the leading nonfuel mineral commodities by value, accounted for nearly all the State's total nonfuel mineral production and value. In 2004, Connecticut's decrease in nonfuel mineral value resulted from a $6 million drop in the value of crushed stone, which was partly offset by a more than $4 million rise in the value of construction sand and gravel. The value of common clay also was up. In 2003, the State's increase in value resulted from increases in the values of both of its major nonfuel mineral commodities (table 1). From 2002-04, the values of dimension stone and gemstones remained virtually unchanged.

The Connecticut Geological Survey[3] provided the narrative information that follows. Fairfield Resources Inc. of Brookfield, Fairfield County, was forced to close its crushed stone quarry in western Connecticut when its land was taken by eminent domain for the building of a State highway bypass.

In a public-private cooperative project, a proposed plan was moving forward to use a water-filled abandoned brownstone quarry operation that is located in the south-central portion of the State near the Connecticut River as a history and recreation center. The largest quarry, the Brazos Quarry, has been closed since the mid-1930s following a flood; the former operation is now owned by the town of Portland. A private company was investigating a possible business venture involving the leasing of the quarries for canoeing, kayaking, swimming, and scuba diving and as an historical exhibit of brownstone and brownstone quarrying. The quarries are deep, with vertical walls on some sides, where rock climbing could also be done.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Nancy W. McHone, an Environmental Analyst with the Connecticut Geological Survey, authored the text of the State mineral industry information provided by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CONNECTICUT[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	55	183	52	143	87	(3)
Gemstones	NA	6	NA	6	NA	6
Sand and gravel, construction	8,140	48,800	8,150	51,200	8,330	55,600
Stone:						
Crushed	10,200	76,500 r	10,400	81,800	10,000	75,700
Dimension	W	(3)	W	(3)	W	(3)
Total	XX	125,000 r	XX	133,000	XX	131,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

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TABLE 2
CONNECTICUT: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2002				2003				2004			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	5	1,020	$8,680	$8.50	5	1,130	$9,410	$8.31	4	1,100	$8,760	$7.98
Dolomite	1	W	W	7.72 r	1	W	W	7.72	1	W	W	8.63
Granite	5	316	2,480	7.85	5	314	2,520	8.02	5	277	2,230	8.03
Traprock	9	8,340	61,700	7.39	9	8,420	65,900	7.83	9	8,080	59,600	7.37
Miscellaneous stone	1	W	W	3.75	1	W	W	3.75	1	W	W	3.75
Total or average	XX	10,200	76,500 r	7.53 r	XX	10,400	81,800	7.88	XX	10,000	75,700	7.53

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3a
CONNECTICUT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	12	$82	$7.07
Filter stone	W	W	13.23
Other coarse aggregates	50	587	11.74
Total or average	62	669	10.79
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	5.51
Bituminous aggregate, coarse	(2)	(2)	5.51
Bituminous surface-treatment aggregate	(2)	(2)	5.51
Other graded coarse aggregates	729	6,930	9.50
Total or average	729	6,930	9.50
Fine aggregate (-¾ inch):			
Stone sand, bituminous mix or seal	(3)	(3)	5.51
Screening, undesignated	(3)	(3)	5.51
Other fine aggregates	92	891	9.68
Total or average	92	891	9.68
Coarse and fine aggregates:			
Graded road base or subbase	341	2,130	6.25
Unpaved road surfacing	(4)	(4)	6.61
Crusher run or fill or waste	(4)	(4)	6.61
Other coarse and fine aggregates	172	1,240	7.20
Total or average	513	3,370	6.57
Other construction materials	25	199	7.96
Unspecified:[5]			
Reported	8,030	62,500	7.78
Estimated	929	7,230	7.78
Total or average	8,960	69,700	7.78
Grand total or average	10,400	81,800	7.88

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."
[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 3b

CONNECTICUT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$6.39
Other coarse aggregates	36	$417	13.99
Total or average	36	417	13.99
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	5.51
Bituminous aggregate, coarse	(2)	(2)	5.51
Bituminous surface-treatment aggregate	(2)	(2)	5.51
Other graded coarse aggregates	802	3,700	4.61
Total or average	802	3,700	4.61
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(3)	(3)	5.51
Other fine aggregates	70	845	12.07
Total or average	70	845	12.07
Coarse and fine aggregates:			
Graded road base or subbase	(4)	(4)	6.32
Other coarse and fine aggregates	299	1,900	6.35
Total or average	299	1,900	6.35
Other construction materials	10	84	8.40
Special, other fillers or extenders	(5)	(5)	7.72
Unspecified:[6]			
Reported	8,430	65,600	7.78
Estimated	410	3,200	7.80
Total or average	8,830	68,700	7.78
Grand total or average	10,000	75,700	7.53

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 4a

CONNECTICUT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	727	$6,430	$8.85
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	354	2,900	8.18
Asphaltic concrete aggregates and other bituminous mixtures	263	1,900	7.23
Road base and coverings	374	2,790	7.47
Fill	333	1,270	3.82
Snow and ice control	169	1,590	9.41
Other miscellaneous uses[3]	41	361	8.82
Unspecified:[4]			
Reported	2,860	15,500	5.44
Estimated	3,000	18,000	6.07
Total or average	8,150	51,200	6.28

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration.

[4]Reported and estimated production without a breakdown by end use.

TABLE 4b

CONNECTICUT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	800	$6,820	$8.52
Asphaltic concrete aggregates and other bituminous mixtures	159	1,250	7.87
Road base and coverings	242	1,900	7.88
Fill	343	1,590	4.63
Snow and ice control	223	2,140	9.59
Other miscellaneous uses[3]	60	561	9.37
Unspecified:[4]			
Reported	2,760	16,300	5.90
Estimated	3,700	25,000	6.69
Total or average	8,330	55,600	6.67

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration.

[4]Reported and estimated production without a breakdown by end use.

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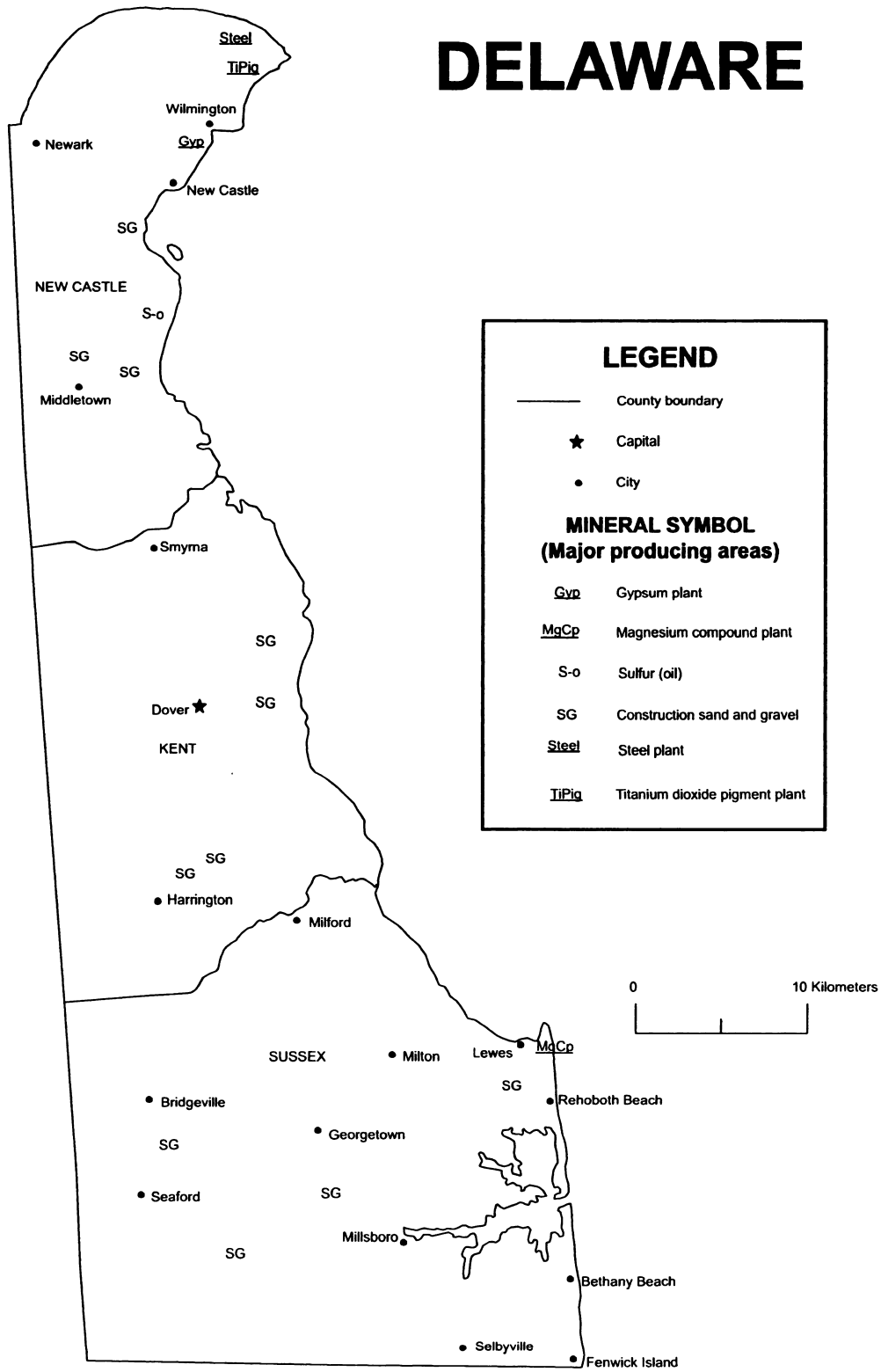
DELAWARE



Source: Delaware Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF DELAWARE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Delaware Geological Survey for collecting information on all nonfuel minerals.

In 2004, Delaware's nonfuel raw mineral production was valued[1] at $21.9 million, based upon annual U.S. Geological Survey (USGS) data. This was a more than 22% increase from that of 2003[2] and followed a 3.4% increase from 2002 to 2003. Because production data for magnesium compounds were withheld to protect company proprietary data, the State's actual annual total values are significantly higher than those listed in table 1.

In 2004, Delaware's leading nonfuel mineral continued to be construction sand and gravel, the production of which rose by nearly 17% with a 22% or $4 million increase in value. Magnesium compounds production was down slightly with a decrease in value of about $1 million. In 2003, with a 16% increase in the production of construction sand and gravel, the increase in value was comparatively smaller, up about $0.6 million. Magnesium compounds production rose with a more than $1 million increase in value. Gemstones mined by hobbyists were valued at the same level for both years (table 1).

In 2004, Delaware continued to rank fourth of five producing States in the quantities of magnesium compounds produced. Magnesium compounds, extracted from seawater close to the mouth of the Delaware Bay, near Lewes, Sussex County, were used to manufacture chemical and pharmaceutical products.

The narrative information that follows was provided by the Delaware Geological Survey[3] (DGS). According to the DGS, there are at least 11 major sand and gravel production operations in Delaware. General locations are shown on the map on the facing page and on the DGS Web site at URL http://www.udel.edu/dgs/Minres/sandmap.html. The DGS estimates of the quantities of sand and gravel produced from the State's natural resources are typically higher than those reported by the USGS (table 1). Reasons for this difference may include (1) not all major producers necessarily report production to the USGS, (2) Government agencies or companies that produce from pits for their own use do not necessarily report production, (3) many operations that mine relatively small amounts of sand and gravel may not have been contacted and, therefore, do not report production, and (4) production of sand from offshore areas for beach replenishment is not included in USGS figures. For example, according to the Delaware Department of Natural Resources and Environmental Control, in 1998, approximately 2.2 million metric tons of sand with an estimated value of $6.9 million was dredged offshore Delaware and placed on beaches along the Atlantic Coast and Delaware Bay. These data, not included in the USGS final 1998 construction sand and gravel data would have nearly doubled that production data and significantly increased value for that year (U.S. Geological Survey, 2001). Based upon DGS estimates, an additional total of about 112,000 metric tons [65,700 cubic meters (86,000 cubic yards)] of sand at an estimated value of more than $350,000 was dredged offshore and placed on Delaware Bay beaches from 1999 through 2003. During 2004, the DGS continued work to further evaluate sand resources offshore and anticipated that it would present its updated estimates during 2005. The DGS reported that the State dredged sand and gravel offshore to replenish areas along Delaware's Atlantic Coast.

The U.S. Department of the Interior's Minerals Management Service (MMS) continued to provide support for studies to characterize offshore sand resources in State and Federal waters for possible use in beach replenishment. Through 2003, the DGS had identified 16 coastal areas of Delaware (covering nearly 28 square kilometers) to be excellent or good sand resource areas containing an estimated 80 million cubic meters of the resource. This work initially was done through the evaluation of 268 vibracores along with geologic mapping and evaluation of seismic data. Exploration and evaluation activities including that of an additional 24 vibracores continued during 2004.

The DGS continues to operate and maintain the DGS Atlantic Outer Continental Shelf Core and Sample Repository. Federal agencies, other State agencies, and private institutions that recognize the value of having a centralized repository contributed samples. The repository contains samples from all 51 oil and gas exploratory wells drilled on the North, Middle, and South Atlantic Outer Continental Shelf between 1977 and 1984. Samples include cores, unwashed cuttings, vials containing samples processed for micropaleontology and palynology, thin sections of cores and cuttings, and micropaleontology and palynology slides. A description of the DGS repository can be found on the DGD Internet Web site at URL http://www.udel.edu/dgs/Minres/ocsrepostxt.html, and a summary of holdings can be viewed at URL http://www.udel.edu/dgs/Minres/ocsrepos.htm. The DGS is designated as the primary repository for these samples by the MMS.

The DGS continued to be actively involved in the mineral industry in Delaware through its identification and evaluation of sand and gravel resources as part of its geologic and hydrologic mapping programs and through service on a county committee involved in evaluating and renewing applications for extractive use operations.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]John H. Talley, Director and State Geologist, authored the text of the State mineral industry information provided by the Delaware Geological Survey.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN DELAWARE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Gemstones		NA	1	NA	1	NA	1
Magnesium compounds	metric tons	W	(3)	W	(3)	W	(3)
Sand and gravel, construction		2,190	17,300	2,550	17,900	2,980	21,900
Total		XX	17,300	XX	17,900	XX	21,900

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2a
DELAWARE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	964	$7,290	$7.56
Fill	803	3,420	4.26
Unspecified:[2]			
Reported	622	6,300	10.12
Estimated	160	940	5.95
Total or average	2,550	17,900	7.05

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Estimated production without a breakdown by end use.

TABLE 2b
DELAWARE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Fill[2]	1,040	$6,620	$6.33
Unspecified:[3]			
Reported	1,120	10,700	9.57
Estimated	820	4,600	5.62
Total or average	2,980	21,900	7.36

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes concrete aggregate and plaster and gunite sands.
[3]Estimated production without a breakdown by end use.

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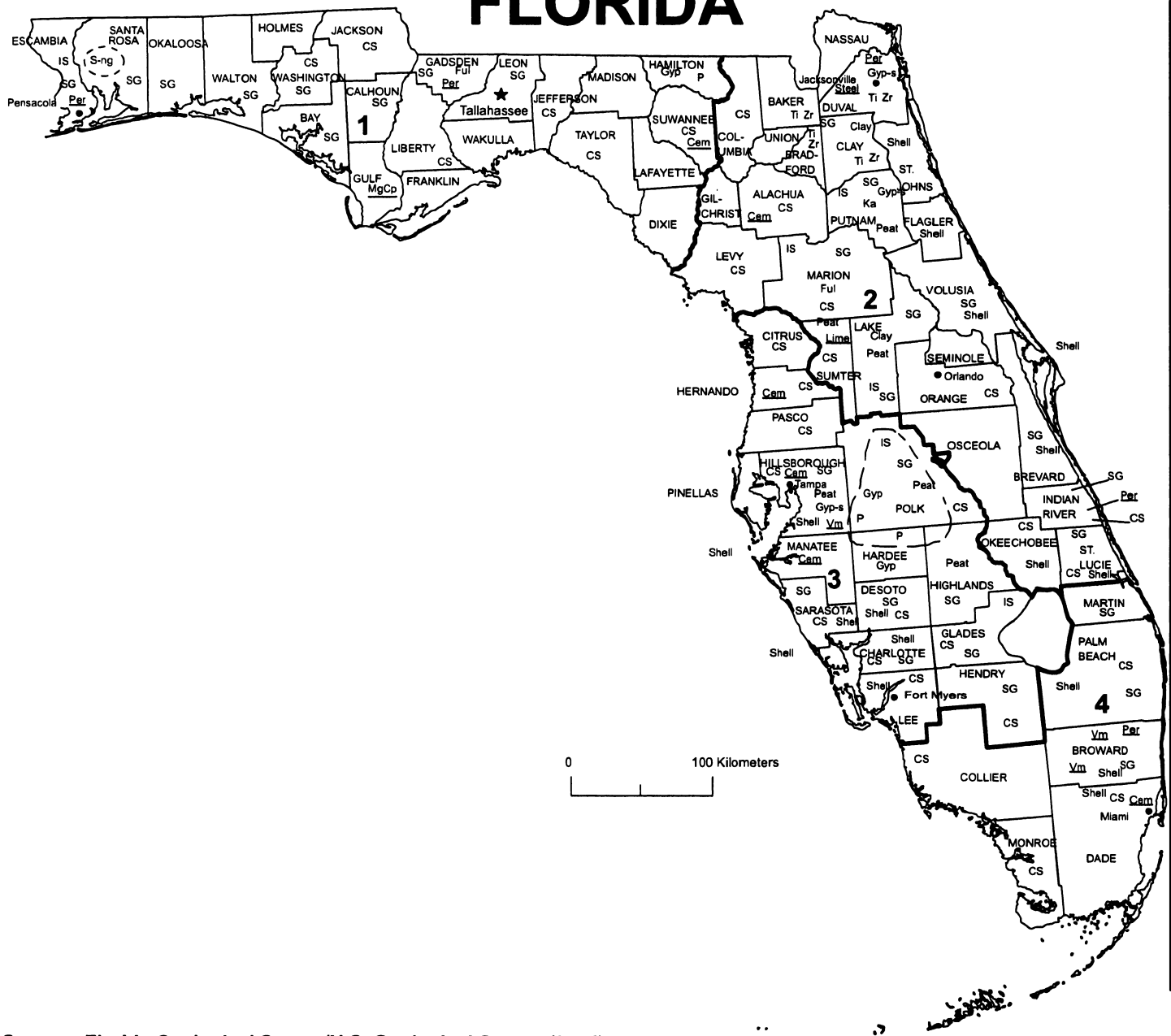
FLORIDA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Ful	Fuller's earth
Gyp	Gypsum
Gyp-s	Synthetic gypsum
IS	Industrial sand
Ka	Kaolin
Lime	Lime plant
MgCp	Magnesium compound plant
P	Phosphate rock
Peat	Peat
Per	Perlite plant
S-ng	Sulfur (natural gas)
SG	Construction sand and gravel
Shell	Shell
Steel	Steel plant
Ti	Titanium minerals
Vm	Vermiculite plant
Zr	Zirconium
◌	Concentration of mineral operations

Source: Florida Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 2004, Florida's nonfuel raw mineral production was valued[1] at $2.32 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 12.1% increase from that of 2003[2] and followed a 2% increase in value in 2003 from that of 2002. The State ranked fourth (fifth in 2003) among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 5% of the U.S. total.

Florida continued to lead the Nation in phosphate rock mining in 2004 by producing more than six times as much as the State with the next highest production. Phosphate rock is produced in only four States. In terms of value, phosphate rock, crushed stone, cement (portland and masonry), and construction sand and gravel continued to be the most important raw nonfuel mineral commodities produced in Florida. The dollar value of these four mineral commodities and the next highest commodity, zirconium concentrates, represented about 94% of the State's total nonfuel mineral value.

In 2004, nearly all of Florida's nonfuel mineral commodities increased in value. Portland cement and crushed stone led the way with increases of $109 million and $83 million, followed by zirconium concentrates and masonry cement, up about $15 million each, fuller's earth, up about $9 million, and construction sand and gravel, up $5 million. Smaller yet significant increases also took place in phosphate rock, peat, industrial sand and gravel, and magnesium compounds. Only rutile showed a decrease, down about $3 million.

In 2003, the State's increase in value mainly resulted from increases in construction sand and gravel, up $27 million, portland cement, up about $26 million, and masonry cement and crushed stone, up about $19 million each. These increases were partly offset by decreases in the values of phosphate rock, down about $23 million, and fuller's earth and zirconium concentrates, down about $9 million each. Smaller yet significant decreases also happened for peat, rutile, industrial sand and gravel, and magnesium compounds (descending order of change) (table 1).

In 2004, Florida continued to be the only State to process rutile and produce staurolite and remained first in the quantity of masonry cement, peat, and phosphate rock produced. While the State continued to be first of two States that produced zirconium concentrates and titanium mineral concentrates and third in crushed stone, it rose in rank to second from third in magnesium compounds, to fifth from seventh in fuller's earth, and to sixth from seventh in portland cement. Additionally, Florida produced significant quantities of construction and industrial sand and gravel.

The Florida Geological Survey[3] (FGS) provided the following narrative information. Production and other data in the following text are those reported by the FGS, based upon that agency's own surveys and estimates. The FGS data may differ from some production figures reported to the USGS.

Employment

The Mine Safety and Health Administration (2004§[4]) reported that for calendar year 2004, 7,103 persons were employed in Florida's mining operations; this number does not take into account contractors that may be working for some operators. The crushed stone industry employed 3,307 workers, and the sand and gravel industry employed 2,626 workers, and the reminder of the workforce was employed by cement, clay, phosphate, and other operations.

Exploration and Development

Expansion of phosphate mining has been proposed in west-central Florida (Hardee and Manatee Counties), to the south in DeSoto County, and in northern Florida in Lafayette County, involving some 32,900 hectares (ha).

While sand supplies were adequate, the same was not true for cement and gravel and crushed stone. Cement and stone aggregates continued to be imported to Florida, although not in quantities exceeding Florida's production levels. Industry standard distances from the source to construction sites for the Nation commonly have an average transportation trucking range of 80 kilometers (km) based on economics (National Stone, Sand and Gravel Association, 2005). In Florida, more than one-half of the crushed stone aggregate comes from the southernmost part of Florida, in particular from Dade County. The remainder of Florida, then, is experiencing progressively larger transportation distances for delivery of stone aggregates, commonly up to 240 km. This, in turn, owing to increasing fuel prices, is elevating aggregate costs to the consumer. In northern Florida, although precise quantities are unknown, stone aggregate is arriving by barges down the Mississippi River, and by rail and ships. In addition, a shortage in qualified truck drivers is aggravating delivery accommodations, as is a shortage in qualified construction personnel in Florida's construction boom. At the currently rising aggregate production levels and because of Florida's rapid population growth, it is anticipated

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]James Balsillie, Coastal/Economic Geologist, authored the text of the State mineral industry information provided by the Florida Geological Survey.

[4]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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that the State's reserves might well be exhausted or in economic jeopardy in a relatively short period of time. The reasons include community and environmental antimining sentiments, preemption of mining rights because of zoning or deed restrictions, and/or other litigation-related land-use constraints.

Florida's mineral resources reach beyond those of terrestrial origin or siting, especially for Florida's excessively broad continental margins in the Gulf of Mexico. FGS research on Florida's marine waters of the Gulf of Mexico has attained recognition by such agencies as the Minerals Management Service (MMS). A significant number of investigations have, during the years, been published or otherwise reported concerning offshore sediments of Florida's Gulf of Mexico. Balsillie and Clark (2001, p. 1) compiled a comprehensive treatment of the subject in a regional, subregional, and Florida county-by-county basis for marine waters of Florida's Gulf Coast. Their study was undertaken to identify what is known about potential sources of sediment for beach restoration and maintenance renourishment and, perhaps, for other task-oriented requirements. They annotated publications and reports to the extent that the user will have a grasp of the information and area of applicability of each included work.

Commodities Review

Industrial Minerals

With the understanding that Florida is among the four most population-gaining States, with some 25,500 new residents arriving monthly, it is small wonder that basic materials to support infrastructure, commercial service-providing establishments, and housing have, in turn, been affected. As in recent years, the construction industry has been hampered by an inadequate supply of materials, in particular, in shortages of aggregates, cement, and steel. In 2004, the mining and processing of basic construction materials in Florida (limestone or lime-rock aggregates whether termed gravel or crushed stone, sand, and cement) composed 55.5% of the total nonfuel valuation of all mined mineral resources or mined commodities of the State.

Cement.—High-purity limestone is used to manufacture the clinker for masonry and portland cement. Florida was a major producer and consumer of both types of cement in 2004. Whereas limestone is mined in a number of counties throughout the State, cement clinker was produced only in Alachua, Dade, Hernando, and Suwannee Counties. Cement plants, which were just grinding plants that used imported clinker, operated in Hillsborough and Manatee Counties. Rinker Materials Corporation, based in West Palm Beach, FL, has acquired seven concrete plants and a small products distribution operation in the northwestern panhandle of Florida (Crestview, Fort Walton Beach, Panama City, Panama City Beach, Pensacola, and Point Washington). Rinker officials have acquired these to expand their operations into the State's northwest where the company has not previously had an operating presence. A Rinker Corp. cement plant expansion is in the works in Hernando County, and three plants in Sumter County are in the permitting phase.

Clays.—Fuller's earth, common clays, and kaolin were mined in several locations in Florida in 2004. Fuller's earth, which was mined in Gadsden and Marion Counties, is typically used as an absorbent material; kaolin, which was mined in Putnam County, is used in the manufacture of paper and refractories. Common clays were mined mostly in Clay and Lake Counties and in small quantities from various locations throughout the State.

Phosphate Rock.—In recent years, the Florida phosphate industry was controlled by some one-half dozen companies in west-central counties of Florida (Hardee, Hillsborough, Manatee, and Polk). In 2004, however, only three companies controlled phosphate rock mining in Florida: CF Industries, Inc., PCS Phosphates, and Mosaic Company, which acquired mining interests of Cargill, Inc. and IMC Global, Inc. Nine phosphate rock mines were active in 2004, totaling some 122,000 ha, of which Mosaic Company controlled 62.6%, or 75,300 ha.

In 2004, phosphate mining activities resulted in mineral products valued at 35.8% of Florida's total nonfuel mineral production. Even so, Florida's production of phosphate rock, based on FGS estimates, accounted for approximately 75% of the U.S. production and 25% of the world's production. FGS records indicate that some 28 million metric tons of phosphate rock was extracted from Florida mines in 2004. Of note, in January, an important source of phosphate rock mining information, the Florida Phosphate Council, was disbanded; its functions have been slated to be assumed by Mosaic Company, whose corporate offices are based in Minnesota.

Metals

Titanium and Zirconium.—E.I. du Pont de Nemours & Co., Inc. and Iluka Resources, Inc. continued to operate heavy-mineral sand mines in Baker, Bradford, Clay, and Duval Counties. Ilmenite, leucoxene, rutile, and zircon are the primary minerals of interest in the heavy-mineral sand deposits of this region. Ilmenite, leucoxene, and rutile are the primary ingredients in the manufacture of titanium dioxide pigments, which, in turn, are used in the manufacture of lacquers, paint, paper, plastics, and varnish. The major uses of zircon are refractories, foundry sands, and ceramic applications.

Environmental Issues and Reclamation

In 2004, the Florida Department of Environmental Protection Bureau of Mine Reclamation issued 25 nonphosphate permits, largely Environmental Resource Permits (ERP) and Wetland Resource Permits, accounting for 2,750 ha of upland and wetland disturbance and mine expansions and modifications. Records indicate that 64% of land mined for phosphate has been reclaimed since July 1, 1975; mined phosphate totaled more than 68,800 ha with 44,500 ha having been reclaimed.

Since July 1, 1975, Florida has required that all mined lands be reclaimed, as administered by FDEP's Bureau of Mine Reclamation. In the past 10 years, more than $325 million has been spent on mandatory as well as other related reclamation projects. Mined land has been reclaimed for agricultural, commercial, industrial, recreational, residential purposes, and as sanctuaries for birds and other wildlife. Since 1980, more

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than 30 million trees have been planted on reclaimed lands. The mining companies have also donated thousands of hectares to State and public entities for recreation and wildlife habitat. The industry has continued to work with the FDEP and other State and Federal agencies to protect and to restore ecosystems and to benefit wildlife.

Governmental and Related Programs

The erosional impacts of hurricanes Charlie, Frances, Ivan, and Jeanne on the coasts of Florida in 2004, resulted in resounding responses from Federal and State Governments. In 2004, the Florida Legislature added an emergency appropriation of $68.4 million to its $30 million annual expenditure level for beach restoration. These funds are, in part, used to cost-share with local governments and with the U.S. Army Corps of Engineers funding of more than $160 million for some 15 Florida beach restoration projects. While most of the funding is used in design phases, dredging and pumping activities, part of this total funding is used for conducting sand search studies in offshore waters. Marine sources of sand for restoration work have been the norm for decades because upland sources have become diminished and/or not economic.

The FGS and the MMS have entered into a multiyear cooperative agreement (cooperative agreement # 1435-0001-30757) with the specific goal of locating and characterizing the areal extent and volume of available sands suitable for beach nourishment lying in Federal waters adjacent to State submerged lands off the northeast coast of Florida. In the second year of this study, 306 km of seismic data were collected offshore Nassau, Duval, and Flagler Counties (Florida Geological Survey, unpub. data). These data were subsequently processed, interpreted, and integrated with the data collected in the first year. A total of 52 vibracores was collected offshore Nassau and Duval Counties. Initial analysis of all vibracore data available for inclusion in FGS-MMS report infers potential reserves of up to 152 million cubic meters of restoration-quality sand offshore southern Duval County. It is anticipated that the analysis of planned vibracores to be obtained for the third year report will facilitate the quality and quantity of potential reserves offshore northern Duval County and all of Nassau County.

The fourth annual Mining Day took place at Florida's State Capitol in 2004. This event was jointly sponsored by the aggregates, phosphate, heavy-minerals, and clay industries in Florida in an attempt to bring awareness of the importance of mining to decisionmakers. Also participating were representatives with presentations from the FDEP's Bureau of Mine Reclamation and the FGS. Some 21 legislative offices were represented, and participants answered inquiries about what makes mining the "backbone of Florida's future" (Florida Limerock and Aggregate Institute, 2004).

The aggregates industry, principally through the Florida Limerock and Aggregate Institute, has been instrumental in conducting a public education program in the elementary schools of Florida communities (Florida Limerock and Aggregate Institute, 2004). This program has received the approval of the State's Department of Education science curriculum section. The program goal is to enhance the science curriculum with more mineral science and mining recognition at the fourth grade level. It is currently targeted to mining areas where the children can be educated as to the work their parents perform and importance of local resources. The program is supported by volunteers from local aggregate mining companies who will donate classroom materials and provide mentoring assistance. In 2004, four schools were engaged in Clermont and Lake County, and five schools, three gifted programs, and a county board of education were engaged in Brooksville, Hernando County. More information about this program and its success can be found on the Web site at URL http://www.flai.org.

As part of an ongoing cooperative effort through the STATEMAP component of the National Cooperative Geologic Mapping Program (a USGS–State of Florida-FGS jointly funded program), in 2004, the FGS completed geologic mapping for the eastern portion of the USGS 1:100,000-scale Gainesville quadrangle and completed the final maps and cross sections for the same area. The completed maps and cross sections are available as part of the FGS Open-File Map Series (Evans and others, 2004).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	591	64,000 e	674	82,900 e	763	97,600 e
Portland	3,950	297,000 e	4,190	323,000 e	5,230	432,000 e
Clays:						
Common	W	W	94 e	1,280 e	W	W
Fuller's earth	W	W	W	W	234	W
Kaolin	32	3,370	31	3,250	31	3,280
Gemstones	NA	1	NA	1	NA	1
Lime	--	--	--	--	24	2,090
Peat	559	11,500	373	7,440	478	9,710
Sand and gravel:						
Construction	26,400	114,000	30,900	141,000	29,300	146,000
Industrial	645	8,640	624	7,270	679	8,520
Stone, crushed	97,700	573,000	97,100	587,000	105,000	675,000
Combined values of magnesium compounds, phosphate rock, staurolite, titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	963,000	XX	918,000	XX	945,000
Total	XX	2,030,000	XX	2,070,000	XX	2,320,000

eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	76	95,900	$561,000	$5.85	72	94,000	$567,000	$6.03	78	103,000	$663,000	$6.43
Dolomite	5	1,200	8,540	7.13	5	1,880	12,500	6.64	4	1,030	6,490	6.32
Shell	3	611	3,900	6.38	3	1,250	7,620	6.09	3	1,150	6,110	5.34
Total or average	XX	97,700	573,000	5.87	XX	97,100	587,000	6.04	XX	105,000	675,000	6.42

XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$13.23
Riprap and jetty stone	37	$393	10.62
Filter stone	W	W	5.03
Other coarse aggregates	422	4,430	10.50
Total or average	459	4,830	10.51
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,510	11,400	7.54
Bituminous aggregate, coarse	(2)	(2)	4.83
Bituminous surface-treatment aggregate	(2)	(2)	5.51
Other graded coarse aggregates	10,100	103,000	10.28
Total or average	11 600	115,000	9.92
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	4.83
Screening, undesignated	3,820	24,600	6.43
Other fine aggregates	8,830	68,100	7.71
Total or average	12,700	92,700	7.33
Coarse and fine aggregates:			
Graded road base or subbase	14,600	52,300	3.59
Unpaved road surfacing	(4)	(4)	5.24
Crusher run or fill or waste	1,320	6,360	4.82
Other coarse and fine aggregates	3,020	20,900	6.90
Total or average	18,900	79,500	4.20
Other construction materials	599	2,110	3.53
Agricultural limestone	(5)	(5)	6.53
Chemical and metallurgical, cement manufacture	(5)	(5)	4.41
Other miscellaneous uses and specified uses not listed	613	2,790	4.55
Unspecified:[6]			
Reported	40,300	230,000	5.71
Estimated	9,100	46,000	5.12
Total or average	49,400	277,000	5.60
Grand total or average	97,100	587,000	6.04

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$13.78
Riprap and jetty stone	151	$1,580	10.48
Filter stone	W	W	14.88
Other coarse aggregates	988	11,100	11.21
Total or average	1,140	12,700	11.11
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,330	25,000	7.49
Bituminous aggregate, coarse	(2)	(2)	4.90
Bituminous surface-treatment aggregate	(2)	(2)	6.06
Railroad ballast	(2)	(2)	5.51
Other graded coarse aggregates	14,000	154,000	10.95
Total or average	17,400	179,000	10.29
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	5.15
Stone sand, bituminous mix or seal	(3)	(3)	6.06
Screening, undesignated	1,600	11,700	7.30
Other fine aggregates	13,500	102,000	7.56
Total or average	15,100	114,000	7.53
Coarse and fine aggregates:			
Graded road base or subbase	17,400	73,300	4.21
Crusher run or fill or waste	1,600	6,590	4.12
Other coarse and fine aggregates	1,370	9,660	7.04
Total or average	20,400	89,600	4.39
Other construction materials	696	2,460	3.53
Agricultural limestone	401	2,820	7.03
Chemical and metallurgical, cement manufacture	4,960	22,100	4.46
Other miscellaneous uses and specified uses not listed	2	17	8.50
Unspecified:[4]			
Reported	39,800	229,000	5.74
Estimated	5,300	24,000	4.57
Total or average	45,200	253,000	5.60
Grand total or average	105,000	675,000	6.42

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	29	356
Coarse aggregate, graded[3]	W	W	W	W	4,620	50,700
Fine aggregate (-⅜ inch)[4]	W	W	W	W	3,250	26,900
Coarse and fine aggregate[5]	329	2,810	7,100	27,900	3,800	21,600
Other construction materials	--	--	--	--	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	--	--	W	W
Other miscellaneous uses and specified uses not listed	--	--	613	2,790	--	--
Unspecified:[8]						
Reported	2,220	11,100	4,120	19,300	12,800	77,200
Estimated	840	4,100	2,300	11,000	1,900	9,900
Total	3,850	25,300	14,600	66,000	28,300	196,000

	District 4	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[2]	W	W
Coarse aggregate, graded[3]	W	W
Fine aggregate (-⅜ inch)[4]	9,190	62,500
Coarse and fine aggregates[5]	7,700	27,200
Other construction materials	599	2,110
Agricultural[6]	--	--
Chemical and metallurgical[7]	W	W
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[8]		
Reported	21,100	123,000
Estimated	4,100	21,000
Total	50,300	300,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and other graded aggregates.

[4]Includes screening (undesignated), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 4b
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	346	2,250
Coarse aggregate, graded[3]	W	W	W	W	6,650	73,600
Fine aggregate (-⅜ inch)[4]	W	W	W	W	4,810	39,900
Coarse and fine aggregate[5]	1,230	6,940	9,390	42,600	1,000	4,740
Other construction materials	--	--	--	--	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	--	--	W	W
Other miscellaneous uses and specified uses not listed	--	--	2	17	--	--
Unspecified:[8]						
Reported	2,270	11,300	4,690	21,700	9,480	61,000
Estimated	750	3,400	770	3,300	2,200	9,500
Total	4,880	32,000	15,600	74,700	28,200	208,000

Use	District 4	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[2]	W	W
Coarse aggregate, graded[3]	10,100	95,800
Fine aggregate (-⅜ inch)[4]	9,940	71,000
Coarse and fine aggregates[5]	8,760	35,300
Other construction materials	696	2,460
Agricultural[6]	--	--
Chemical and metallurgical[7]	W	W
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[8]		
Reported	23,400	135,000
Estimated	1,600	8,200
Total	56,600	360,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture.

[8]Reported and estimated production without a breakdown by end use.

TABLE 5a
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,180	$39,300	$5.47
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	953	4,850	5.09
Asphaltic concrete aggregates and road base materials	1,270	5,140	4.02
Fill	3,600	6,580	1.83
Other miscellaneous uses	570	2,320	4.07
Unspecified:[3]			
Reported	11,100	57,800	5.19
Estimated	6,200	25,000	4.04
Total or average	30,900	141,000	4.56

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 5b
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,550	$62,400	$6.54
Plaster and gunite sands	951	5,380	5.65
Asphaltic concrete aggregates and road base materials	724	3,170	4.37
Fill	3,130	7,280	2.33
Other miscellaneous uses	701	4,390	6.26
Unspecified:[2]			
Reported	7,430	34,400	4.63
Estimated	6,800	29,000	4.29
Total or average	29,300	146,000	4.99

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 6a
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	470	2,040	W	W	W	W
Asphaltic concrete aggregates and road base materials	--	--	W	W	W	W
Fill	550	1,250	1,350	1,490	1,700	3,830
Other miscellaneous uses	4	16	5,450	30,100	4,050	19,500
Unspecified:[3]						
Reported	489	2,440	6,060	32,400	4,590	23,000
Estimated	1,800	7,100	2,800	12,000	1,000	4,200
Total	3,350	12,900	15,600	75,500	11,300	50,400

Use	District 4	
	Quantity	Value
Concrete aggregate and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Fill	--	--
Other miscellaneous uses	--	--
Unspecified:[3]	--	--
Reported	--	--
Estimated	590	2,100
Total	590	2,100

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6b

FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	W	W	W	W	3,140	18,900
Asphaltic concrete aggregates and road base materials	--	--	W	W	W	W
Fill	350	386	11	42	2,770	6,850
Other miscellaneous uses	288	1,200	7,350	49,400	1,150	5,900
Unspecified:[3]						
Reported	173	793	1,570	7,820	5,690	25,800
Estimated	2,000	8,500	2,900	13,000	1,100	5,000
Total	2,830	10,900	11,800	69,900	13,900	62,500

Use	District 4	
	Quantity	Value
Concrete aggregates (including concrete sand)[2]	--	--
Asphaltic concrete aggregates and road base materials	--	--
Fill	--	--
Other miscellaneous uses	--	--
Unspecified:[3]		
Reported	--	--
Estimated	790	3,100
Total	790	3,100

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Reported and estimated production without a breakdown by end use.

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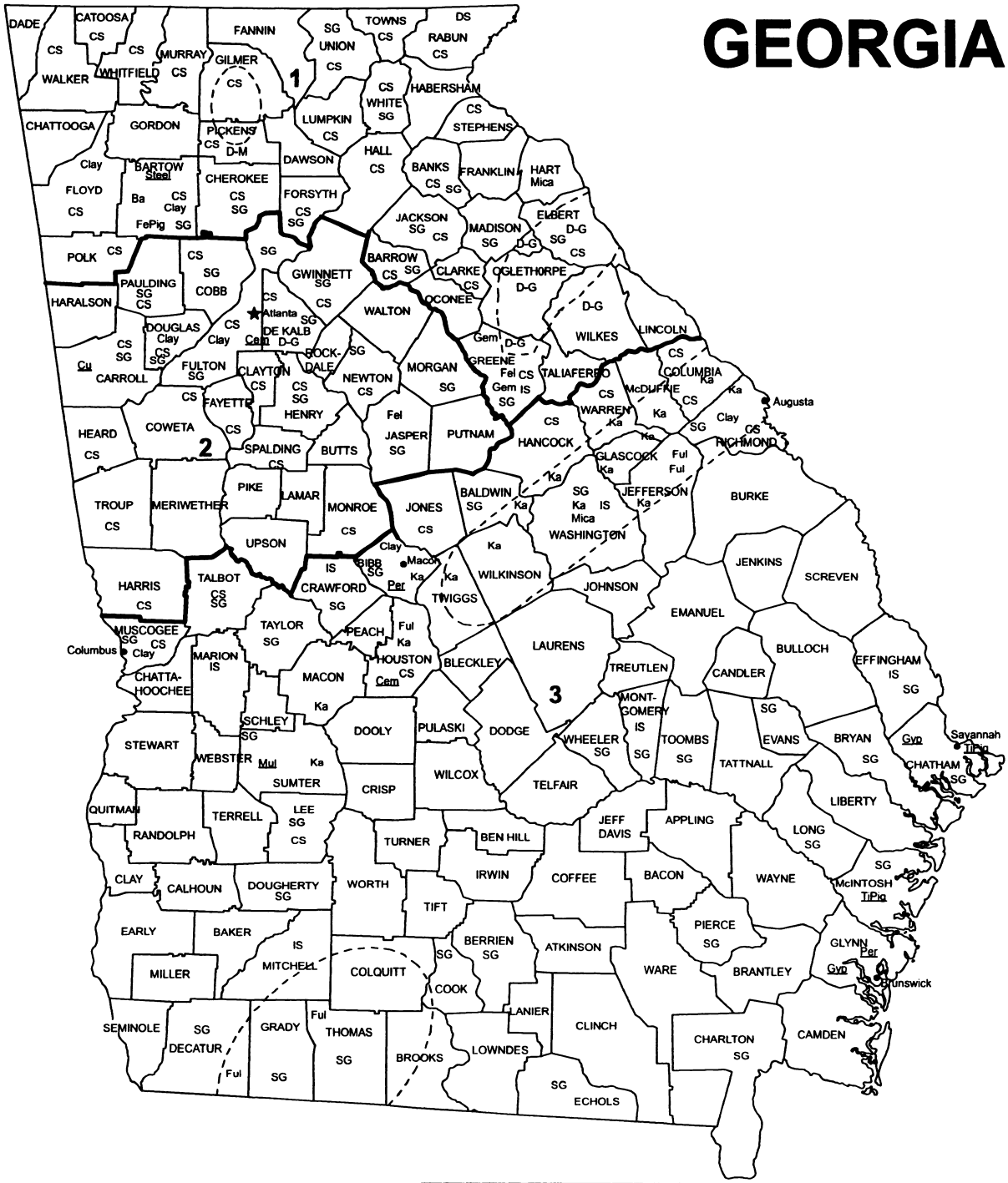
GEORGIA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Ba	Barite	DS	Dimension stone	Mica	Mica
Cem	Cement plant	Fel	Feldspar	Mul	Synthetic mullite plant
Clay	Common clay	FePig	Iron oxide pigments	Per	Perlite plant
CS	Crushed stone	Ful	Fuller's earth	SG	Construction sand and gravel
Cu	Copper plant	Gem	Gemstones	Steel	Steel plant
D-G	Dimension granite	Gyp	Gypsum plant	TiPig	Titanium dioxide pigment plant
D-M	Dimension marble	IS	Industrial sand		Concentration of mineral operations
		Ka	Kaolin		

0 50 Kilometers

Source: Georgia Geologic Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF GEORGIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Georgia Department of Natural Resources, Georgia Geologic Survey, for collecting information on all nonfuel minerals.

In 2004, Georgia's nonfuel raw mineral production was valued[1] at $1.8 billion, based upon annual U.S. Geological Survey (USGS) data. This was about a 3.4% increase from that of 2003[2] and followed a 6.1% increase from 2002 to 2003. The State was eighth in rank (sixth in 2003) among the 50 States in total nonfuel mineral production value, of which Georgia accounted for more than 4% of the U.S. total.

Georgia was by far the leading clay-producing State in the Nation in 2004, accounting for about 24% of total U.S. clay production (all kinds) and producing more than 2.7 times the quantity of clay as the next highest producing State. Kaolin remained the State's foremost nonfuel raw mineral commodity, accounting for more than 49% of Georgia's total nonfuel mineral production value and, of that, about 86% of its total clay value. Crushed stone was second, accounting for more than 30% of the State's nonfuel mineral value, followed by fuller's earth, portland cement, masonry cement, and construction sand and gravel.

In 2004, increases in the production and related values of crushed stone, masonry cement, kaolin, and construction sand and gravel led the Georgia's increase in value for the year; these increases were $25 million, nearly $18 million, $14 million, and $7.6 million, respectively. Smaller yet significant increases also took place in the production and values of common clays, industrial sand and gravel, and portland cement. The largest decrease in value was in fuller's earth, down $3 million (table 1). All other changes were of less than $1 million, having less of an effect on the overall net total.

In 2003, increases in the production and values of crushed stone and fuller's earth were up $58 million and about $51 million, respectively, which led to the State's rise in value. Construction sand and gravel and dimension stone production and values showed smaller yet significant increases of about $5 million each. The largest decreases took place in kaolin and cement. The value of kaolin was down by $9 million; and although the production of masonry cement and portland cement each increased, their values decreased, to a combined total of about $7 million. Decreases of $2 million or less took place in the values of barite, mica, and feldspar (descending order of change).

In 2004, Georgia continued to lead the Nation in the quantities of kaolin, fuller's earth, and iron oxide pigments produced (descending order of value). It remained second of two barite-producing States and third of five States that produce mica. While the State rose to fourth from fifth in the production of crushed stone and common clays and to eighth from ninth in masonry cement, it decreased to third from second in dimension stone and to fifth from fourth in feldspar. Additionally, Georgia was a significant producer of portland cement and industrial sand and gravel.

---

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN GEORGIA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	1,310	5,500	1,280	4,430	1,550	8,710
Fuller's earth	979	93,800	1,570	145,000	1,400	142,000
Kaolin	6,830	893,000	6,610	884,000	6,780	898,000
Gemstones	NA	8	NA	8	NA	9
Sand and gravel:						
Construction	6,600	27,200	7,690	31,800	9,270	39,400
Industrial	606	12,200	590	11,900	665	13,400
Stone:						
Crushed	70,500 r	461,000 r	75,200	519,000	79,500	544,000
Dimension	111	18,200	114	22,700	146	22,100
Combined values of barite, cement, clays [bentonite (2002)], feldspar, iron oxide pigments (crude), lime, mica (crude)	XX	129,000 r	XX	117,000	XX	134,000
Total	XX	1,640,000 r	XX	1,740,000	XX	1,800,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
GEORGIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	18	9,480	$61,500	$6.49	18	8,770	$61,800	$7.04	18	8,450	$60,100	$7.12
Marble	6	W	W	6.37	7	W	W	6.51	7	W	W	6.60
Granite	53	59,300	389,000	6.56	54	63,200	434,000	6.87	53	67,800	461,000	6.79
Quartzite	2	W	W	5.25	2	W	W	7.93	2	W	W	7.93
Total or average	XX	70,500 r	461,000 r	6.54 r	XX	75,200	519,000	6.91	XX	79,500	544,000	6.85

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	1,310	$14,500	$11.09
Filter stone	W	W	9.37
Other coarse aggregates	161	1,160	7.18
Total or average	1,470	15,700	10.66
Coarse aggregate, graded:			
Concrete aggregate, coarse	9,380	77,300	8.24
Bituminous aggregate, coarse	4,100	35,600	8.67
Railroad ballast	942	5,990	6.36
Other graded coarse aggregates	4,050	33,500	8.28
Total or average	18,500	152,000	8.25
Fine aggregate (-⅜ inch):			
Stone sand, concrete	3,690	28,000	7.60
Stone sand, bituminous mix or seal	(2)	(2)	6.17
Screening, undesignated	405	2,820	6.96
Other fine aggregates	3,330	19,000	5.71
Total or average	7,430	49,800	6.71
Coarse and fine aggregates:			
Graded road base or subbase	9,500	56,900	6.00
Unpaved road surfacing	(3)	(3)	6.59
Crusher run or fill or waste	475	2,480	5.22
Other coarse and fine aggregates	3,330	17,800	5.34
Total or average	13,300	77,200	5.81
Other construction materials	188	1,780	9.50
Agricultural limestone	(4)	(4)	5.27
Chemical and metallurgical; cement manufacture	(4)	(4)	9.48
Special:			
Asphalt fillers or extenders	(5)	(5)	5.79
Other fillers or extenders	(5)	(5)	7.72
Total or average	591	4,160	7.03
Unspecified:[6]			
Reported	31,900	207,000	6.49
Estimated	1,840	11,400	6.20
Total or average	33,700	218,000	6.48
Grand total or average	75,200	519,000	6.91

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[5]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$11.15
Filter stone	W	W	9.09
Other coarse aggregates	1,550	$16,700	10.82
Total or average	1,550	16,700	10.82
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	8.38
Bituminous aggregate, coarse	(2)	(2)	8.47
Railroad ballast	740	4,800	6.48
Other graded coarse aggregates	15,400	129,000	8.33
Total or average	16,200	133,000	8.24
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	7.28
Stone sand, bituminous mix or seal	(3)	(3)	6.08
Screening, undesignated	(3)	(3)	2.52
Other fine aggregates	7,200	46,400	6.44
Total or average	7,200	46,400	6.44
Coarse and fine aggregates:			
Graded road base or subbase	(4)	(4)	6.06
Terrazzo and exposed aggregate	(4)	(4)	7.71
Crusher run or fill or waste	613	1,040	1.69
Other coarse and fine aggregates	11,500	67,100	5.83
Total or average	12,100	68,200	5.62
Agricultural limestone	(5)	(5)	5.06
Chemical and metallurgical, cement manufacture	(5)	(5)	8.71
Special, other fillers or extenders	(5)	(5)	7.71
Unspecified:[6]			
Reported	38,600	253,000	6.56
Estimated	2,500	16,000	6.15
Total or average	41,200	269,000	6.54
Grand total or average	79,500	544,000	6.85

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 4a

GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	5,880	49,500	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	4,620	27,400	W	W	W	W
Other construction materials	188	1,780	--	--	--	--
Agricultural[6]	(7)	(7)	--	--	--	--
Chemical and metallurgical[8]	--	--	--	--	(7)	(7)
Special[9]	W	W	W	W	--	--
Unspecified:[10]						
Reported	7,570	48,900	9,290	61,200	15,000	96,800
Estimated	1,840	11,400	--	--	--	--
Total	23,300	163,000	34,800	247,000	17,100	109,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[8]Includes cement manufacture.

[9]Includes asphalt fillers or extenders and other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b

GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	3,400	28,400	11,700	97,800	W	W
Fine aggregate (-⅜ inch)[4]	1,610	12,800	W	W	W	W
Coarse and fine aggregate[5]	2,760	17,700	W	W	W	W
Agricultural[6]	W	W	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W
Special[8]	W	W	--	--	--	--
Unspecified:[9]						
Reported	12,800	87,000	8,750	58,700	17,100	108,000
Estimated	2,500	16,000	--	--	--	--
Total	23,800	167,000	35,900	251,000	19,800	126,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture.

[8]Includes other fillers or extenders.

TABLE 5a

GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,380	$10,000	$4.22
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	633	2,830	4.47
Asphaltic concrete aggregates and other bituminous mixtures	70	261	3.73
Fill	60	178	2.96
Other miscellaneous uses	19	108	5.59
Unspecified:[3]			
Reported	2,780	10,600	3.81
Estimated	1,800	7,800	4.49
Total or average	7,690	31,800	4.14

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 5b
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	3,820	$17,500	$4.57
Fill	50	239	4.75
Other miscellaneous uses	8	65	7.70
Unspecified:[3]			
Reported	3,810	15,100	3.97
Estimated	1,600	6,500	4.16
Total or average	9,270	39,400	4.26

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes asphaltic concrete aggregates and other bituminous mixtures, and plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6a
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT [1]

(Thousand metric tons and thousand dollars)

Use	District 1 and 2[2]		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	W	W	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	W	W
Fill	--	--	60	178
Other miscellaneous uses[4]	373	1,680	2,730	11,500
Unspecified:[5]				
Reported	456	1,630	2,320	8,960
Estimated	320	1,900	1,400	5,900
Total	1,150	5,250	6,540	26,600

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes asphaltic concrete aggregates.
[5]Reported and estimated production without a breakdown by end use.

TABLE 6b
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT [1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	218	1,210	134	807	3,470	15,500
Fill	18	160	--	--	32	79
Other miscellaneous uses	--	--	--	--	8	65
Unspecified:[3]						
Reported	--	--	265	1,100	3,550	14,000
Estimated	260	1,100	150	670	1,200	4,800
Total	491	2,420	551	2,570	8,220	34,500

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes asphaltic concrete aggregates and other bituminous mixtures, and plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

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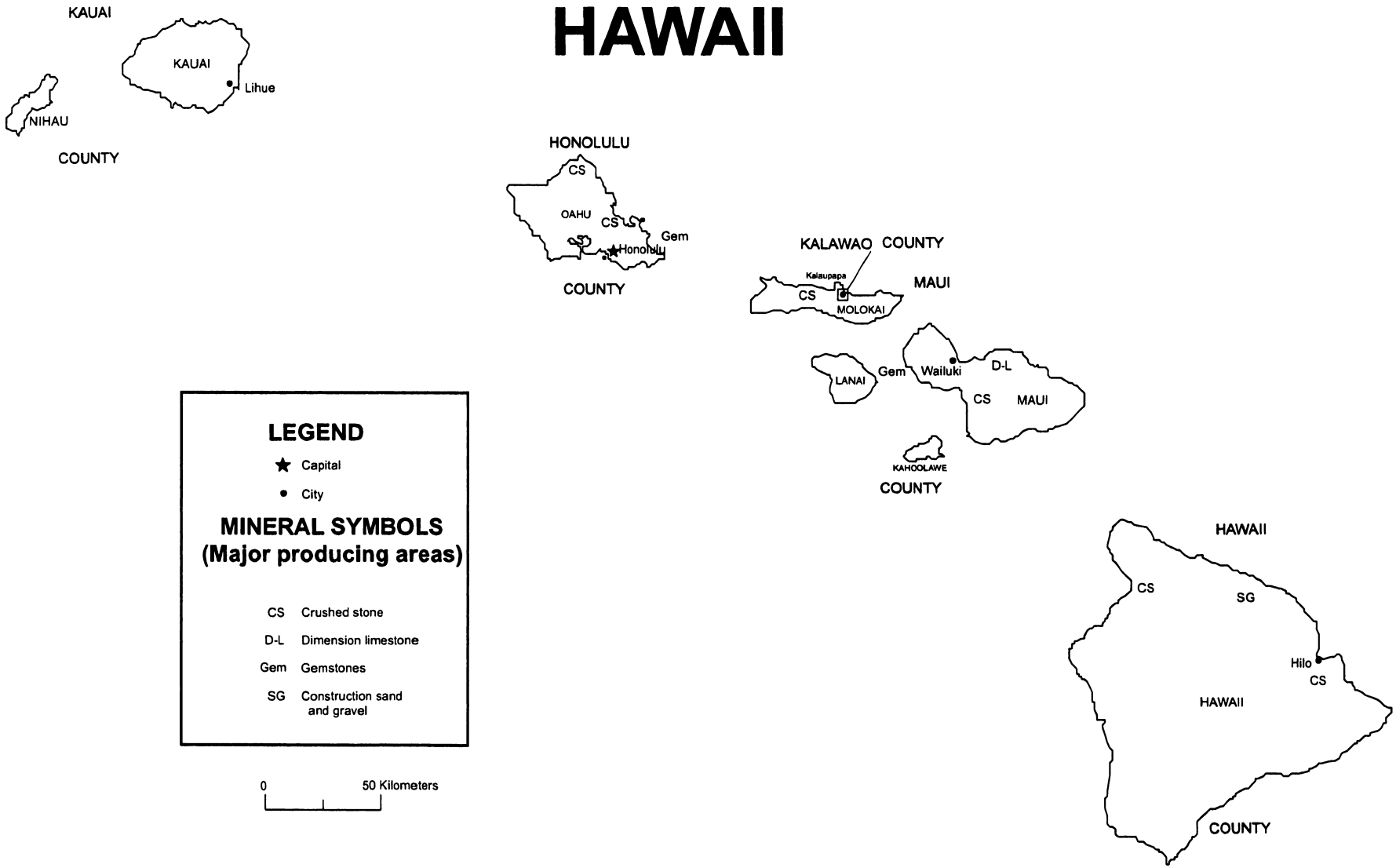
HAWAII



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Source: Hawaii Commission of Water and Resources Management/U.S. Geological Survey (2004)

THE MINERAL INDUSTRY OF HAWAII

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Hawaii Department of Land Resources, Commission of Water Resources Management, for collecting information on all nonfuel minerals.

In 2004, Hawaii nonfuel raw mineral production was valued[1] at $71.2 million, based upon annual U.S. Geological Survey (USGS) data. This was a decrease in value of about 5.2% compared with that of 2003,[2] which was up 3.9% from 2002. Mining in Hawaii consisted mostly of the quarrying of stone, used to produce crushed stone, and the extraction of sand and gravel from open pits, both commodities produced for use by the construction industry. Gemstones also were produced, mostly black coral and precious coral.

In 2004, construction sand and gravel production increased by more than 55%, with its related value up about $2.5 million. But this was more than balanced out by a decrease in the production of crushed stone, its value down $6.5 million, resulting in the State's net decrease for the year. Although having minimal effect on the State's overall change in value, gemstones production, based on value, more than doubled, up about 120%.

Similarly, in 2003, construction sand and gravel production increased, with its value up about $2.6 million; and although crushed stone production was down by about 12%, its value was up, slightly (table 1). Gemstones also had a small increase in its value for the year. Hawaii Cement Co. produced a small quantity of masonry cement in 2003 from what remained of the company's stockpiled portland cement materials (table 1). In 2001, Hawaii Cement had decided to stop production at its plant on the island of Oahu, Honolulu County, and rely solely on imported cement. This operation, which had produced cement from imported clinker, was the only cement plant in the State. (Clinker is the intermediate, kiln-processed product of cement manufacture.) The company stopped importing clinker in March 2001 and permanently closed its grinding plant in September (van Oss, 2003, p. 16.3). In 2001, in coordination with the shutdown, the company completed construction of its twin 30,000-metric-ton cement silos for storage of imported cement (Wurlitzer, 2001).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

References Cited

van Oss, H.G., 2003, Cement, *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2001, v. I, p. 16.1-16.31.

Wurlitzer, Dane, 2001, Hawaiian success: International Cement Review, March, p. 41-42.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN HAWAII[1,2]

(Thousand metric tons and thousand dollars)

	2002		2003		2004	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement, masonry	W	(3)	W	(3)	--	--
Gemstones	NA	109	NA	119	NA	262
Sand and gravel, construction	610	7,010	808	9,560	1,260	12,100
Stone, crushed	6,380	65,100	5,620	65,400	5,190	58,900
Total	XX	72,300	XX	75,100	XX	71,200

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value excluded to avoid disclosing company proprietary data.

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TABLE 2
HAWAII: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	6	W	W	$9.19	2	W	W	$13.79	1	W	W	$16.63
Traprock	14	5,600	$57,800	10.34	17	4,870	$58,100	11.94	16	4,640	$53,600	11.56
Volcanic cinder and scoria	3	W	W	8.38	1	W	W	8.60	1	W	W	8.60
Miscellaneous stone	1	W	W	9.49	1	W	W	9.81	1	W	W	9.81
Total or average	XX	6,380	65,100	10.20	XX	5,620	65,400	11.63	XX	5,190	58,900	11.34

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3a
HAWAII: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$30.18
Filter stone	W	W	17.21
Other coarse aggregates	71	$1,280	18.03
Total or average	71	1,280	18.03
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	14.90
Bituminous surface-treatment aggregate	(2)	(2)	13.34
Other graded coarse aggregates	837	12,900	15.41
Total or average	837	12,900	15.41
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	28.30
Stone sand, bituminous mix or seal	(3)	(3)	14.72
Other fine aggregates	463	11,300	24.45
Total or average	463	11,300	24.45
Coarse and fine aggregates:			
Graded road base or subbase	(4)	(4)	8.57
Terrazzo and exposed aggregate	(4)	(4)	4.41
Crusher run or fill or waste	(4)	(4)	7.82
Other coarse and fine aggregates	995	8,410	8.46
Total or average	995	8,410	8.46
Other construction materials	4	103	24.64
Unspecified, estimated[5]	3,300	31,000	9.65
Grand total or average	5,620	65,400	11.63

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."
[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[5]Estimated production without a breakdown by end use.

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TABLE 3b

HAWAII: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$35.42
Filter stone	W	W	15.14
Other coarse aggregates	60	$988	16.47
Total or average	60	988	16.47
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	14.57
Bituminous surface-treatment aggregate	(2)	(2)	13.37
Other graded coarse aggregates	778	11,400	14.66
Total or average	778	11,400	14.66
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	29.04
Stone sand, bituminous mix or seal	(3)	(3)	10.23
Other fine aggregates	376	9,200	24.46
Total or average	376	9,200	24.46
Coarse and fine aggregates:			
Graded road base or subbase	(4)	(4)	12.12
Crusher run or fill or waste	965	5,850	6.06
Other coarse and fine aggregates	171	2,140	12.51
Total or average	1,140	7,990	7.03
Unspecified, estimated[5]	2,800	29,000	10.32
Grand total or average	5,190	58,900	11.34

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Estimated production without a breakdown by end use.

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TABLE 4a
HAWAII: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	224	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	22	W	W
Asphaltic concrete aggregates and road base materials	276	W	W
Fill	132	W	W
Other miscellaneous uses	12	W	W
Unspecified, estimated[3]	140	$1,600	$11.02
Total or average	808	9,560	11.82

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Estimated production without a breakdown by end use.

TABLE 4b
HAWAII: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	331	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	24	W	W
Asphaltic concrete aggregates and road base materials	155	W	W
Fill	449	W	W
Other miscellaneous uses	16	W	W
Unspecified, estimated[3]	280	$2,600	$9.27
Total or average	1,260	12,100	9.65

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Estimated production without a breakdown by end use.

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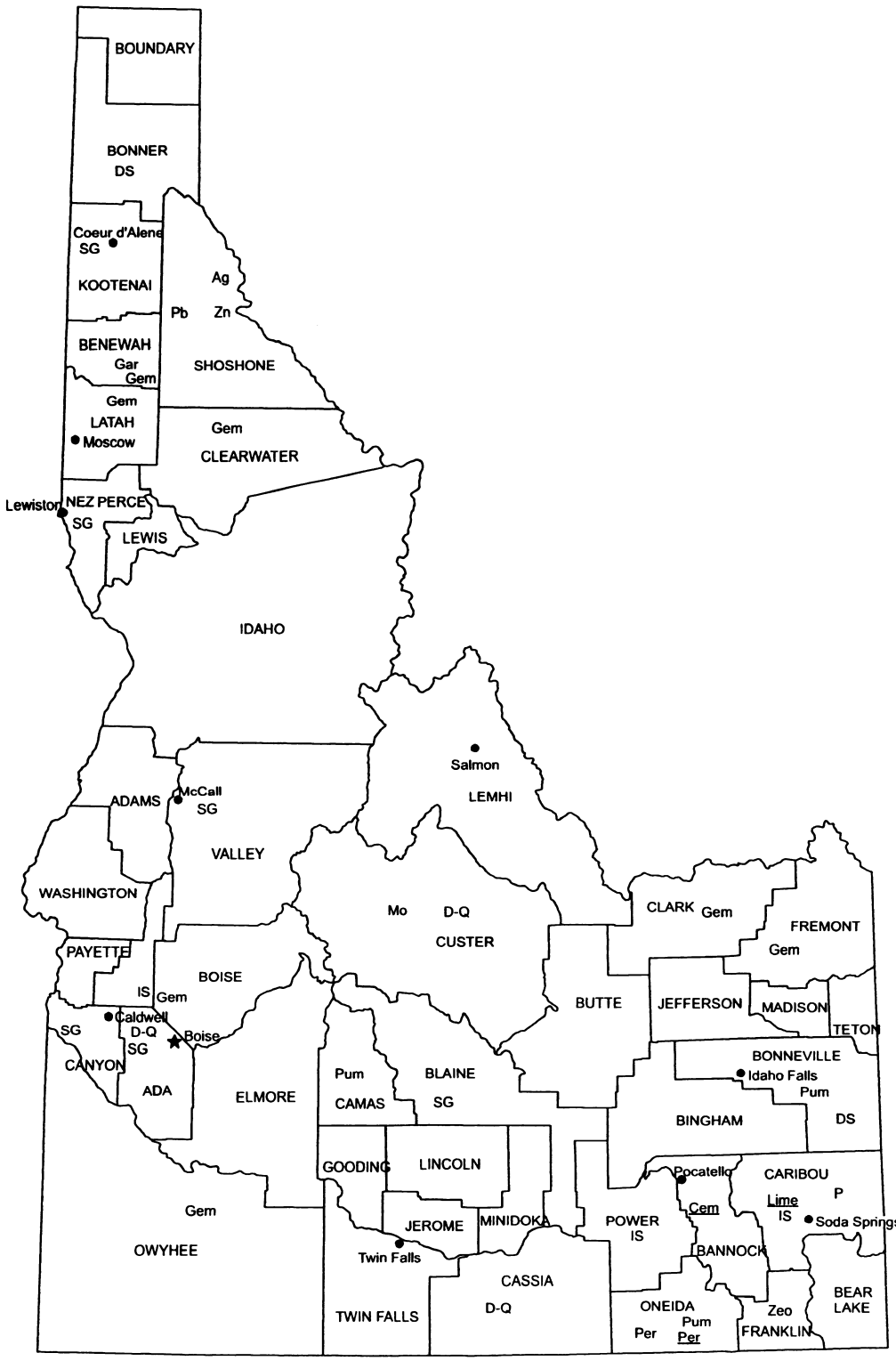

LEGEND

- County boundary
- Capital
- City

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Cem	Cement plant
D-Q	Dimension quartzite
DS	Dimension stone
Gar	Garnet
Gem	Gemstones
IS	Industrial sand
Lime	Lime plant
Mo	Molybdenum
P	Phosphate rock
Pb	Lead
Per	Perlite
Per	Perlite plant
Pum	Pumice and pumicite
SG	Construction sand and gravel
Zn	Zinc
Zeo	Zeolites

0 100 Kilometers

Source: Idaho Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF IDAHO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Idaho Geological Survey for collecting information on all nonfuel minerals.

In 2004, the estimated value[1] of nonfuel mineral production for Idaho was $446 million based upon annual U.S. Geological Survey (USGS) data. This was a nearly 66% increase from that of 2003[2] and followed a less than 1% decrease from 2002 to 2003. The State rose to 34th from 37th in rank among the 50 States in total nonfuel mineral production value, of which Idaho accounted for 1% of the U.S. total.

Phosphate rock, construction sand and gravel, molybdenum concentrates, silver, portland cement, and crushed stone, in descending order of value, were Idaho's leading nonfuel minerals and accounted for about 91% of the State's total nonfuel mineral production value in 2004. Industrial minerals accounted for approximately 51% of the State's total nonfuel mineral value; copper, lead, molybdenum concentrates, silver, and zinc accounted for the remainder. In 2004, the largest increases in value were for molybdenum concentrates, which were up by more than $110 million; phosphate rock, up by about $20 million; silver, up by about $10 million; and construction sand and gravel, up by more than $7 million. Most of the State's other nonfuel minerals also increased in value.

In 2003, the largest increases in value were those of molybdenum concentrates, which were up by about $11 million; lime, up by about $3 million; and lead and construction sand and gravel, up by about $2 million each. These increases were slightly offset by decreases in silver, which was down by more than $5 million; phosphate rock and copper, down by about $4 million each; portland cement, down by about $3 million; zinc, down by about $2 million; and gold and industrial garnet, down by about $1 million each, resulting in a small net decrease (table 1).

During the past 6 years, the value of metals and industrial minerals as a percentage of the State's total nonfuel mineral value has fluctuated significantly. The overall value of metals production rose sharply from 30% in 2003 to more than 48% in 2004 mostly owing to a substantial increase in the average price of molybdenum concentrates mined from Thompson Creek Mining Co.'s large open pit molybdenum mine in Custer County. The values of the State's other mined metals also rose in 2004, especially that of silver, which was up by more than 20% in spite of a slight decrease in silver production. The value of metals production had decreased to 28% in 2001 and 29% in 2002 from 45% and 43% in 1999 and 2000, respectively. The lower values in 2001-02 resulted mainly from a substantial decrease in gold production in 2001 from that of 2000, which continued to decrease significantly in 2002 mostly as a result of the closing down of operations at the Beartrack Mine in Lemhi County; gold production ceased in the State during 2003.

Based upon USGS estimates of the quantities produced in the United States during 2004, Idaho continued to rank second in phosphate rock and second of the two industrial-garnet-producing States, third in (descending order of value) silver and lead, fourth in molybdenum concentrates and zeolites, fifth in zinc and pumice, and sixth in gemstones. Additionally, the State rose to fifth from seventh in the production of perlite, and it was a significant producer of construction sand and gravel and industrial sand and gravel.

The Idaho Geological Survey[3] (IGS) provided the narrative information that follows.

Higher commodity prices from increasing demand helped fuel an increase in exploration activity and an increase in the value of Idaho's nonfuel mineral production to $446 million (table 1). This was a sizable jump from the 2003 final data value of only $269 million. Higher silver, molybdenum, and base-metal prices were accompanied by an increased demand for aggregate and phosphate rock. In 2004, employment at the State's metal and nonmetal mines increased about 10% to 1,960 compared with 1,769 in 2003. These numbers do not include the approximately 1,000 workers at three large phosphate-processing chemical plants in southeastern Idaho.

Exploration and Development Activities

The higher silver prices, which stayed in the $6- to $7-per-troy-ounce range for 2004, helped to pay for new development costs at the two deep underground mines in the Coeur d'Alene District in Shoshone County. Since 1884, the District production has totaled more than 36,800 metric tons (t) (1.180 billion troy ounces) of silver from the rich quartz-siderite-sulfide veins. Hecla Mining Co. added 50 employees at the Lucky Friday Mine in Mullan to assist with the new $8.5 million production drift on the 1,800-meter (m) level to connect the Silver Shaft with the Gold Hunter deposit. About 1,220 m of the 1,460-m-long drift was completed during the year, and another eight core holes were drilled to test ore grades and extensions of the system. The company also experimented with new ways to use slusher stopes on some of the narrower veins. Coeur d'Alene Mines Corp. produced nearly 109 t (3.5 million troy ounces) of silver from their Galena Mine, mostly by mechanized cut and fill. The extensive development work

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data for 2004 are preliminary and are expected to change; related rankings also may change.

[3]Virginia S. Gillerman, Associate Research Geologist/Economic Geologist, authored the text of the State mineral industry information provided by the Idaho Geological Survey.

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included a horizontal passage west on the 1,000-m level, deep exploration along the Polaris Fault and the 72 vein, and 12,000 m of diamond drilling.

Sterling Mining Co. worked to restore the Jewell Shaft and hoist system at the Sunshine Mine, which it had acquired in 2001. Sterling also awarded a contract to Atlas Faucett to restore the Silver Summit Tunnel, which can serve as escapeway for the Sunshine Mine. Sterling targeted an induced polarization/resistivity anomaly by drilling four core holes from the surface and discovered several veins, at least one of which was mineralized. It also acquired property from Merger Mines Inc. and Metropolitan Mines Corp.

New Jersey Mining Co. had a portfolio of six exploration properties in the Coeur d'Alene District and nearby region and a mill at Kellogg. The company drilled its New Jersey Mine and two other properties, staked a new discovery (named the Silver Button), continued U.S. Forest Service permitting for the Silver Strand silver-gold underground mine, and developed the Golden Chest Mine near Murray, Shoshone County. In the 1980s, Newmont Mining Corp. had drilled out a small open pit gold resource at the Golden Chest, which was the largest lode mine in the district. New Jersey Mining, which acquired the property in 2003, constructed a ramp from the surface down to intersect with the high-grade Katie Dora vein. The company mined a bulk sample for test milling and drilled four surface exploration holes, which hit ore-grade rock below the historic workings. In December, New Jersey Mining announced its decision to proceed with mining the Katie Dora vein (New Jersey Mining Co., 2004§[4]).

Elsewhere in northern Idaho, Valencia Ventures Inc. optioned the Idaho Gold Project from Beartooth Platinum Corp. The project included the previously permitted Buffalo Gulch resource, which was estimated to contain 4.5 million metric tons (Mt) of ore at 0.79 gram per metric ton (g/t) gold, and the Friday-Petsite properties near Elk City. Beartooth had drilled both locales in early summer to confirm grades that had been determined in previous work.

In the Warren District in central Idaho, Kimberly Gold Mines, Inc. purchased the Rescue Mine and mill. Kimberly replaced the collapsed roof on the mill and finished an extensive site cleanup at the small high-grade underground gold mine. Unity Gold-Silver Mines and Sidney Resources Corp. also worked their lode properties in the Warren District. Elsewhere in central Idaho, Vista Gold Corp. held the 62-t gold sulfide resource at Stibnite, and American Independence Mining continued legal negotiations and geochemical work at the Golden Hand Mine near Big Creek.

In Lemhi County, Nevada Contact drilled seven holes at Iron Creek and returned the property to its owner. Wave Exploration Corp. worked on the Musgrove Creek gold property, which hosts a 9-t gold resource based on prior drilling by discoverer Atlas Precious Metals Inc. and Newmont. Wave conducted surface geochemical sampling and drilled four reverse circulation holes.

In the Blackbird Mining District, high cobalt and copper prices enabled Formation Capital Corp. to resume exploration and permitting activities for its proposed underground cobalt-copper-gold mine. Formation drilled 7,580 m of core in 28 holes and did extensive geologic work. The total resource for the Idaho Cobalt Project, including the Ram and the Sunshine with the 0.2% cutoff contains a combined measured and indicated mineral resource of 1,979,000 t grading 0.60 % cobalt, 0.56% copper, and 0.48 grams per metric ton (g/t) gold. The inferred mineral resource at the 0.2% cutoff stands at 1,366,000 t grading 0.58 % cobalt, 0.87% copper, and 0.55 g/t gold (Formation Capital Corp., 2005, p. 2).

In eastern Idaho, Trio Gold Corp. agreed with Sultana Resources LLC to explore the Empire Mine property near Mackay in Custer County (Trio Gold Corp., 2004§). The polymetallic skarn was drilled by Cambior Exploration USA, Inc. in the mid-1990s. Trio was reportedly interested in the open pit copper potential of the historic district. Kilgore Gold Co. explored the epithermal gold-silver property in Clark County where previous drilling delineated a resource of about 15 t of gold. Kilgore drilled six holes and, in spite of numerous drilling problems, encountered low-grade mineralization under a new geochemical anomaly named Dog Bone Ridge.

In southwestern Idaho, Nevada Contact held the Blacksheep epithermal prospect and Milestone Fault zone north of the DeLamar Mine in Owyhee County. Desert Mineral Mining LLC proposed a controversial but very small gold operation in the Neal District east of Boise. Mosquito Consolidated Gold Mines Ltd. acquired an option on the large Cumo property northwest of Idaho City in Boise County. Cumo, which was discovered by Amax Exploration Inc. in the 1970s, is a 403-Mt low-grade (0.135% molybdenum) system at a significant depth.

In the Atlanta Mining District of Elmore County, Atlanta Gold Corp. forged ahead with permitting work on an open pit heap-leach gold-silver mine on historic Atlanta Hill just west of the Sawtooth Mountains. More than 61,000 m of past drilling was used by a consultant to calculate a minable reserve of 12.4 Mt of gold-silver ore at a grade of 2 g/t gold in two pits.

Exploration for industrial minerals was limited to phosphate, feldspar-clay, and decorative rock.

Commodity Review

Industrial Minerals

Agrium Inc., J.R. Simplot Company, and Monsanto Co. mined and processed phosphate rock from southeastern Idaho's Phosphoria Formation. Phosphate rock production continued to be the State's largest mineral industry. Simplot produced at full capacity at its Smoky Canyon Mine and initiated a controversial environmental impact statement to expand southward to the Deer Creek and Manning areas, which are partly located in a roadless area. Simplot had a large drilling program at the Dairy Syncline property. Monsanto completed mining the Enoch Valley Mine and started construction on a high-tech waste dump to encapsulate selenium-bearing waste shale. Monsanto's production has shifted to the South Rasmussen Ridge Mine, and the company explored the Blackfoot River Bridge project.

Agrium announced that it would take over the Dry Valley phosphate mine, which had been developed by Astaris

[4]References that include a section mark (§) are found in the Internet References Cited section.

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Production LLC, which left the business in 2003 (Agrium Inc., 2004§). Phosphate fertilizer demand increased owing in part to 2004 hurricane-related shutdowns of the Florida operations. Agrium shipped nearly 1.8 Mt of ore from the Rasmussen Ridge Mine before announcing that it had taken over the phosphate leases from Astaris. The company planned to mothball the Rasmussen Ridge Mine and to shift production over to the former Astaris Dry Valley Mine.

Prices for decorative stone continued to be strong, which was a favorable situation for the four major Oakley stone producers on Middle Mountain in south-central Idaho. L&W Stone Corp. extracted some 31,000 t of prized Three Rivers stone from the quarry near Clayton and received approval from the U.S Bureau of Land Management for a new plan of operations. The small Ramshorn quarry at Bayhorse applied to expand from private to Federal land. Aggregate production, cement (produced primarily by Ash Grove Cement Co. in Inkom), industrial garnet, and zeolites were in high demand.

Idaho Minerals LLC resumed active perlite mining after it secured a major contract with a Canadian supplier of horticultural products. In addition, Hess Pumice Products, Inc. reported a market demand shift to more low-unit-value, higher tonnage amounts of pumice used for construction products from high-unit-value ultrafine, and ultrapure grade pumice used in polishing television screens. This was owing to the entry of cheaper Chinese pumice into the television screen markets of the Pacific Rim.

Cement and construction sand and gravel production increased approximately 10% from the level of 2003. This was in line with Idaho's visibly booming construction industry in the Boise-Nampa, Coeur d'Alene, and Idaho Falls population centers. Continued growth in 2005 could result in local shortages and price increases.

Metals

Higher average prices enabled the silver mines and the giant Thompson Creek molybdenum mine in Custer County to make money. Molybdenum prices averaged about $30 per kilogram in 2004, which was nearly triple those of 2003 (Magyar, 2005). Thompson Creek's workforce increased to 160, and with the 2003 stripping done, most of 2004 was spent mining phase 5 ore. Approximately 6,800 t of concentrate were produced from the large open pit.

Environmental Issues and Mine Reclamation

The Idaho Department of Lands, in conjunction with other State and Federal agencies, honored the phosphate industry with most of its 2004 Reclamation Awards. Winners included Agrium (operations at Rasmussen Ridge), Astaris (special project to relocate and restore Upper Dry Valley Creek), Monsanto (special project of vegetative management at South Rasmussen), and Simplot (exploration reclamation at the Deer Creek, the Manning Creek, and the Wells Canyon leases). Much of the reclamation work centered on ways to minimize and prevent selenium release into surface and ground waters. The middle waste shales of the Phosphoria Formation are naturally enriched in selenium. Efforts by a joint industry-agency working group to address the selenium problem were being driven by requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

Government Programs

Geologic mapping continued with Federal matching funding from the STATEMAP program, a component of the USGS National Cooperative Geologic Mapping Program (NCGMP). The NCGMP distributes funding through STATEMAP for participating State geological surveys.

The IGS made available more than 60 new digital geologic maps; many were available on the IGS Web site at URL www.idahogeology.org. Mapping was conducted near the Lewiston, the Moscow, the Orofino, the Sandpoint, and the Twin Falls regions. The IGS Mines and Prospects database, which includes data for more than 8,000 historic mines in the State, was made available on the IGS Web site and as a CD-ROM. The IGS, in cooperation with the Federal land-management agencies, continued its field surveys of inactive mines sites. These were examined for physical safety and environmental hazards.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IDAHO[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	460	NA	477	NA	836
Sand and gravel, construction	15,700	57,700	16,500	59,300	19,600 [3]	74,300
Stone, crushed	3,420	15,800	3,160	15,700	3,320 [3]	17,400
Combined values of cement (portland), copper, feldspar, garnet (industrial), gold (2002-03), lead, lime, molybdenum concentrates, perlite (crude), phosphate rock, pumice and pumicite, sand and gravel (industrial), silver, stone [dimension granite, quartz, sandstone (2002), dimension quartzite and sandstone (2003-04)], zeolites (2004), zinc	XX	197,000	XX	193,000	XX	354,000
Total	XX	271,000	XX	269,000	XX	446,000

NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
IDAHO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	3	460	$2,890	$6.29	6	550	$3,970	$7.23	8	404	$2,680	$6.63
Shell	1	W	W	7.08 [r]	1	W	W	7.02	1	W	W	7.67
Granite	8	160	793	4.96	8	362	1,350	3.72	10	452	2,600	5.75
Traprock	36	2,140	9,140	4.27	23	1,690	7,710	4.57	22	1,880	9,130	4.86
Quartzite	2	W	W	4.28	2	W	W	4.72	2	W	W	4.89
Miscellaneous stone	5	279	1,280	4.60	4	172	715	4.16	4	148	800	5.40
Total or average	XX	3,420	15,800	4.62	XX	3,160	15,700	4.95	XX	3,320	17,400	5.25

[r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

IDAHO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	39	$275	$7.14
Filter stone	29	177	6.14
Other coarse aggregates	150	268	1.79
Total or average	218	938	4.30
Coarse aggregate, graded:			
Concrete aggregate, coarse	13	123	9.83
Bituminous aggregate, coarse	W	W	5.91
Bituminous surface-treatment aggregate	50	385	7.72
Railroad ballast	W	W	10.28
Total or average	172	1,190	6.92
Fine aggregate (-¾ inch):			
Stone sand, concrete	W	W	11.02
Stone sand, bituminous mix or seal	W	W	5.14
Screening, undesignated	W	W	4.31
Total or average	74	593	8.01
Coarse and fine aggregates:			
Graded road base or subbase	978	4,110	4.20
Unpaved road surfacing	87	272	3.13
Crusher run or fill or waste	57	168	2.96
Other coarse and fine aggregates	63	574	9.15
Total or average	1,190	5,120	4.32
Agricultural:			
Agricultural limestone	W	W	4.41
Poultry grit and mineral food	W	W	25.35
Total or average	33	592	17.94
Chemical and metallurgical:			
Cement manufacture	W	W	4.41
Flux stone	W	W	4.41
Total or average	628	2,770	4.41
Special:			
Mine dusting or acid water treatment	W	W	25.35
Asphalt fillers or extenders	W	W	4.41
Total or average	2	46	23.00
Other miscellaneous uses and specified uses not listed	28	912	31.69
Unspecified:[2]			
Reported	576	2,570	4.46
Estimated	247	1,150	4.65
Total or average	823	3,710	4.51
Grand total or average	3,160	15,700	4.95

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

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TABLE 3b

IDAHO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	20	$124	$6.20
Filter stone	W	W	6.20
Other coarse aggregates	8	48	6.00
Total or average	28	172	6.14
Coarse aggregate, graded:			
Bituminous aggregate, coarse	321	2,460	7.66
Bituminous surface-treatment aggregate	21	149	7.16
Total or average	342	2,610	7.62
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	34	182	5.35
Other fine aggregate	2	19	9.50
Total or average	36	201	5.58
Coarse and fine aggregates:			
Graded road base or subbase	1,100	4,810	4.37
Unpaved road surfacing	47	155	3.28
Other coarse and fine aggregates	71	358	5.04
Total or average	1,220	5,320	4.37
Agricultural:			
Poultry grit and mineral food	(2)	(2)	25.35
Other agricultural uses	(2)	(2)	4.41
Total or average	31	601	19.39
Chemical and metallurgical, cement manufacture	(3)	(3)	2.76
Special:			
Mine dusting or acid water treatment	(2)	(2)	25.36
Asphalt fillers or extenders	(2)	(2)	3.27
Total or average	2	42	21.00
Other miscellaneous uses:			
Chemicals	(2)	(2)	30.87
Other specified uses not listed	(2)	(2)	4.41
Total or average	283	2,140	7.57
Unspecified:[4]			
Reported	941	3,700	3.93
Estimated	440	2,600	5.95
Total or average	1,380	6,330	4.58
Grand total or average	3,320	17,400	5.25

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a
IDAHO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,950	$9,540	$4.88
Plaster and gunite sands	18	83	4.60
Concrete products (blocks, bricks, pipe, decorative, etc.)	20	158	7.82
Asphaltic concrete aggregates and other bituminous mixtures	910	3,870	4.26
Road base and coverings[2]	4,860	15,100	2.82
Fill	599	1,850	3.09
Snow and ice control	82	502	6.14
Other miscellaneous uses	5	25	4.51
Unspecified:[3]			
Reported	2,090	7,090	3.39
Estimated	5,900	21,000	3.56
Total or average	16,500	59,300	3.60

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Reported and estimated production without a breakdown by end use.

TABLE 4b
IDAHO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,510	$8,860	$5.85
Plaster and gunite sands	63	335	5.34
Concrete products (blocks, bricks, pipe, decorative, etc.)	22	172	7.69
Asphaltic concrete aggregates and other bituminous mixtures	940	5,080	5.40
Road base and coverings[2]	5,530	19,200	3.47
Fill	916	2,650	2.89
Snow and ice control	108	651	6.05
Railroad ballast	32	289	9.08
Other miscellaneous uses	31	154	4.90
Unspecified:[3]			
Reported	3,330	11,200	3.36
Estimated	7,100	26,000	3.61
Total or average	19,600	74,300	3.79

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Reported and estimated production without a breakdown by end use.

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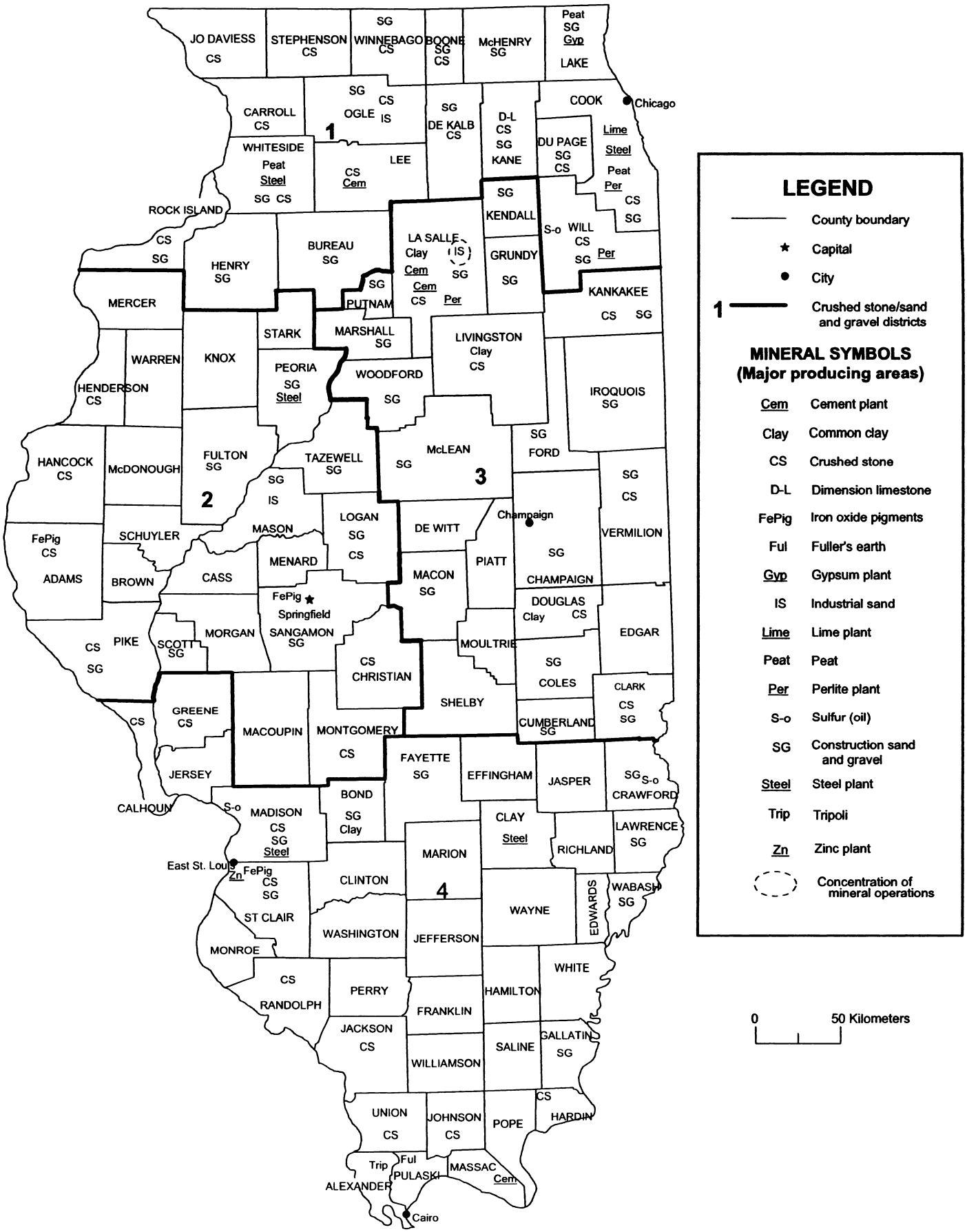
ILLINOIS



Source: Illinois State Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF ILLINOIS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Illinois State Geological Survey for collecting information on all nonfuel minerals.

In 2004, Illinois' nonfuel raw mineral production was valued[1] at $1.05 billion, based upon annual U.S. Geological Survey (USGS) data. This was an 8.1% increase from that of 2003[2] and followed a 5.8% increase from 2002 to 2003. The State rose to 15th from 16th in rank among the 50 States in the total nonfuel raw mineral production value and accounted for about 2.3% of the U.S. total.

Industrial minerals accounted for all of Illinois' nonfuel mineral production in 2004; metals have not been produced from mines in the State since 1996 when small quantities of copper, lead, silver, and zinc were produced. In 2004, crushed stone, by value, remained the State's leading nonfuel mineral commodity, accounting for more than 44% of the total nonfuel mineral value, followed by, in descending order of value, portland cement, with about 22%; construction sand and gravel, with more than 19%; industrial sand and gravel, with about 8%; and lime, fuller's earth, and tripoli, with most of the remaining 6%. All other nonfuel minerals each accounted for less than one-half of 1% of the State's total (table 1).

In 2004, increases in the production and values of construction sand and gravel, value up by $42 million, and portland cement, value up by $23 million, led the State's increase in value for the year. Other significant increases included those of industrial sand and gravel, value up $13.6 million, crushed stone, up $12 million, and tripoli, up by about $1.6 million more than that of 2003. The only commodities with decreases in production and value were those of lime, value down more than $7 million, and fuller's earth, value down slightly less than $3 million (table 1).

In 2003, the production levels and values of most of the State's nonfuel mineral commodities rose, led by increases in crushed stone, construction sand and gravel, and fuller's earth, the values of which increased by $22 million, $15 million, and nearly $15 million, respectively. Additionally, the value of portland cement was up by $6 million, and that of tripoli was up by nearly $1 million. Lime was the only mineral commodity with a significant decrease in production and value, value down slightly more than $3 million (table 1).

In 2004, Illinois continued to be 1st in the quantities of industrial sand and gravel produced and 1st among 4 States that produce tripoli, 4th in the production of peat, and 10th in portland cement. While the State decreased to fifth from fourth in crushed stone and to sixth from fifth in fuller's earth, it continued to be a significant producer of common clays, construction sand and gravel, and lime. Raw steel was produced in Illinois, but it was processed from materials obtained from other domestic and foreign sources. Although there was a reduction in the manufacture of raw steel in the State from 6.5 million metric tons (Mt) to about 4 Mt, Illinois remained one of the Nation's leading raw steel-producing States (American Iron and Steel Institute, 2004, p. 76).

The following narrative information was provided by the Illinois State Geological Survey[3] (ISGS).

Commodity Review

Industrial Minerals

Crushed Stone and Sand and Gravel.—Construction aggregate resources in Illinois primarily include, in order of abundance, dolomite, limestone, and sand and gravel. Very small amounts of skid resistant sandstone aggregate also are produced in the southern part of the State. Sand and gravel deposits are widely distributed throughout the State, but they are most abundant and of highest quality in northeastern Illinois.

Dolomite is produced from the Silurian and Ordovician rocks in northern Illinois, especially in the Chicago area. Northeastern Illinois is one of the leading aggregate producing and consuming regions in the country and will likely remain so long into the future. In the western and southern parts of the State, limestones of the Mississippian System are actively exploited for cement manufacture, construction aggregate, and other related purposes. Limited amounts of Pennsylvanian-age limestone occur in the central part of the State and are quarried where they are present near the surface. In these areas, underground mining may be necessary to meet the region's crushed stone needs because near-surface limestone beds are thin and commonly unsuited for use in concrete highways.

Increased demand for aggregate and declining reserves in existing quarries has sparked the search for new mining areas. A fundamental change in the aggregates industry of northeastern Illinois continues, as underground mining has become a new option for many producers. The Chicago metropolitan area has always been a major consumer of crushed stone and, because of its geology, has always been a major producer of these materials. Since pioneer settlement of the area began in the 1830s, Silurian age high-purity dolomites at the bedrock surface were the primary source of stone construction materials. Although the region is largely covered by thick deposits of Quaternary sediments, outcrops of the Silurian rocks present

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Zak Lasemi, Geologist and Head, Industrial Minerals and Resource Economics Section and Donald G. Mikulic, Geologist, coauthored the text of the State mineral industry information provided by the Illinois State Geological Survey.

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at a number of widely scattered locations became the primary source of building stone and lime for the area. By the early 1900s, the demand for these materials diminished but was replaced by an even greater need for crushed stone aggregates. Growth in the quarrying industry continued throughout much of the 20th century, but the future local supply of crushed stone has now become a major concern. The most important reason for this concern has been the limited potential for opening new quarries needed to replace those that have exhausted their reserves. Since the 1980s, a new source of aggregates has been targeted literally under the feet of some producers. The Silurian dolomites of the region are underlain by nearly 60 meters (m) of Ordovician shales which overlie about 90 m of Ordovician dolomites. A number of producers have or are in the process of mining these reserves under the floors of their exhausted surface quarries or beneath old gravel pits that never had potential for the development of quarries in Silurian rocks. The change to these subsurface sources has been slow but in recent years has begun to accelerate. Currently, two underground mines are in operation and four others are in the planning stage or are under development. Surface reserves of Silurian dolomites will probably last the largest Chicago area quarries for the next couple of decades but many of the smaller sites will probably need to consider underground mining in the near future.

The combination of depleting near-surface reserves and difficulty in obtaining zoning and other permits for new geologically suitable quarry sites continues to impact the crushed stone and sand and gravel industries. Opposition to aggregate mining is no longer limited to populated areas. Opening or expansion of quarries and pits also is strongly contested by citizens in many rural areas throughout the State. Some of the major developments include ongoing hearings and controversies in central Illinois at Henry (Marshall County) regarding a petition to mine sand and gravel along the Illinois River Valley. The mining operation was halted by the county's zoning ordinance and the issue is now partly in the hands of the court. In Spring Grove, McHenry County, IL, 200 people attended a public meeting to hear and express opposition to the proposed annexation of a 30-hectare (ha) tract for mining sand and gravel. In other developments, after 50 years of operation, a quarry in Loves Park, Winnebago County, was scheduled to close in 2 or 3 more years. The quarry appeared in the movie "Groundhog Day" and was the site where Kevin Uliassi launched hot-air balloon trips in an attempt to travel solo around the world in the 1990s and 2000.

A permit for a new gravel pit on a 57-ha tract near the border with Wisconsin was approved by the county board in McHenry County. The operation will move forward under the condition that the operator drill wells to monitor ground water contamination, limit the hours of operation, and build an earth berm at least 9 m high around the site. The Harvard City Council, McHenry County, approved a gravel pit despite opposition. Meyer Material Company will mine sand and gravel on 320 ha north of the city with a reserve of 56 Mt. It will take Meyer Material more than 40 years to mine the property. Because of shallow ground water in the area, the operation will use wet mining with a dredge. The operation is expected to bring $7 million of tax revenue to the city. Meyer has also promised to donate to the city about 20 ha that could be used as a park. Despite opposition from the community, the Kane County board recommended zoning approval for extracting sand and gravel on more than 140 ha of the Max McGraw Wildlife Foundation property in Dundee Township. With support from the foundation, Beverly Materials secured a permit to mine sand and gravel on the property and reclaim the site in 4-ha increments during a 30-year period. In another development, cement giant CEMEX announced that it has signed a letter of intent to sell its Dixon-Marquette plant in Dixon, IL, to Votorantim Cimentos Ltda. CEMEX acquired the 630,000-metric-ton-per-year-capacity dry process plant from Prairie Group in 2003. The transaction was expected to close in the first quarter of 2005. Eagle Materials Inc. entered into an agreement to purchase the remaining 50% interest in the Illinois Cement Company in LaSalle, IL, from RAAM LP.

Northeastern Illinois counties such as Kendal, Kane, and McHenry, have or are planning to implement advisory councils that meet regularly to discuss mining-related issues and increase dialogue between the industry, government, and the public. They are also actively pursuing measures to protect aggregate resources for future mining through land-use planning. Through the Illinois Association of Aggregate Producers (IAAP), the Illinois aggregate industry continued to work to promote greater public awareness of the aggregate industry for economic growth and for environmental practices through workshops, videotapes and brochures, mine open houses, school visits, and an informative Internet site. Quarries and pits are increasingly adopting a "good-neighbor policy" through open houses that allow the public to visit the operation and learn about mining methods and the value of the mined-out material. For such an event in 2004, Meyer Material Company's Crystal Lake gravel pit (McHenry County) hosted 1,900 people. Bus tours of the pit kept a continuous flow of guests moving through the pit to learn about the mining and use of sand and gravel.

Termination of the Illinois FIRST program, ongoing State budget crises, and uncertainty about the Federal Transportation Equity Act for the 21st Century (TEA-21), which authorizes funds for transportation projects, significantly reduced State and Federal funding for road improvement and repair. Reauthorization of TEA-21 is critical for the much needed maintenance and repair of Federal highways that is a major source of demand for the State's crushed stone and sand and gravel aggregate. According to the Illinois Department of Transportation (IDOT), Illinois has the third largest network of State and local roads and the sixth largest interstate highway system in the country. The State also has more than 26,000 bridges, 8,227 of which are on the State system. The State highway system is heavily used. One of the main objectives of the IDOT strategic plan is keeping bridges, roads, and interstate highways in top quality conditions. More than 1,400 kilometers of infrastructure was improved during 2004. The IDOT's planned road projects are concentrated in the Chicago, St. Louis Metro East, Jacksonville, and Champaign-Urbana regions. Other projects were planned in and north of Springfield and along I-80 in northern Illinois. These areas were also areas of larger cities and population concentrations. The aggregate industry contributed significantly to this accomplishment by

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providing the needed raw material, primarily crushed stone and sand and gravel that make up more than 80% of asphalt and concrete pavement. The IDOT expected that to be able to continue with maintenance and development of roads for economic development at a rate comparable with the rate under the Illinois FIRST Program, a combined total of State and Federal funding in the range of $12.1 to $20.3 billion will be needed during FYs 2004-09.

Environmental Issues and Reclamation

Mine Reclamation

Mineral producers continue to address environmental issues and actively reclaim properties to allow new beneficial uses once mining is completed. Abandoned stone quarries in Illinois have turned into storm water-detention basins, golf courses, fishing lakes, and industrial and commercial developments. Many in northeastern Illinois are realizing that reclamation of sand and gravel pits into residential communities can prove beneficial to everyone. New home owners in the area can receive lakefront property around the water-filled pit, the community avoids the creation of another landfill, and the quarry operators make one last large sale of their property. Multiple townships in the Chicago area are following this line of thinking. Vulcan Materials Company has several reclamation programs, including Vulcan's Casey Quarry which was the recipient of the 2001 and 2002 Illinois DNR reclamation award for a noncoal facility. The Casey Quarry was also awarded the National Stone, Sand and Gravel Association's 2004 Silver Environmental Eagle Award. The award recognized the accomplishments of the staff at Casey for implementing a consecutive reclamation program that continually generates new aquatic and prairie habitats, while minimizing the total "active" areas of the mine.

In southern Illinois, Unimin Specialty Minerals has made its environmental program a key to its community relation program. Unimin operated a tripoli (microcrystalline silica) mine and processing plant in Alexander County. According to Rock Products, the company mined tripoli in open pits on 8 ha but owns 800 ha and holds the mineral rights to another 4,000 ha, including 30 long-abandoned underground silica mines. The underground mines have become habitat to an endangered bat species known as the Indiana bats, and Unimin gained the Wildlife Habitat Council (WHC) certification to help protect the bat population. The company partnered with the Illinois Department of Natural Resources, Bat Conservation International, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture's Forest Service to enhance and protect the bat habitat in what is called the Magazine Mine. The site was credited as hosting the largest bat population in Illinois. Unimin's efforts extended well beyond the bats' habitat to include other animals such as turkeys, white-tailed deer, and bluebirds. The company operated 88 plants worldwide, and 31 sites are WHC-certified. The southern Illinois tripoli mine site is the company's flagship operation when it comes to WHC certification.

A noteworthy reclamation project began a new phase in 2004 when the Stearns Quarry landfill was closed in Chicago. This quarry operated from 1833 until 1970 and was the first in the Chicago area to open and the last to close in the city. The Stearns Lime and Stone Company followed by Material Service Corporation were the primary operators during most of this time period. The quarry has considerable scientific and historical importance. During the next few years, the city plans to develop the site as a park, preserving a small part of the old rock wall, which will provide a unique educational opportunity for the public.

Environmental Technology

In 2004, the ISGS, with partial funding from the Illinois Clean Coal Institute (ICCI), expanded the study that began in 2003 to locate and characterize suitable carbonate rock resources near coal-fired powerplants throughout the State. In 2004, the ISGS completed a survey of the suitability of limestone and dolomite resources in the southern half of the State for use in scrubbing sulfur from the exhaust gases of coal-fired powerplants. With several new mine-mouth powerplants planned, demand for dolomite or limestone to use in extracting sulfur oxides from stack gases was expected to increase substantially. Studies of the physical and chemical characteristics of the rocks, showed that coarse-grained, high-calcium limestones generally are best suited for use in wet scrubber systems, whereas dolomites, apparently because of greater magnesium-carbonate content, work best at the higher temperatures of fluidized bed boilers. The geologists found that the sulfur-scrubbing capacity of the carbonate rocks mined in a quarry can vary from one layer to another and, in some instances, a company may need to mine and sell the stone from a particular layer to serve the needs of a nearby powerplant. In the second year of the project, the ISGS geologists will examine the sulfur-scrubbing capacity of the carbonate rocks in the northern half of the State. The primary goal of the ICCI-funded project is the completion of a comprehensive database and a set of maps on the quality and distribution of scrubber stone resources of the State.

The U.S. Patent and Trademark Office issued patent number 6,793,079 B2 to inventors Latif Khan and John Lytle of the ISGS and Ken Ho of the Illinois Clean Coal Institute for a device called a froth washer. When installed on froth flotation machines in existing coal-cleaning plants or other plants that separate valuable minerals from wastes, the device helps them operate much more efficiently and capture more of the valuable materials. This technology, and two others disclosed by ISGS to the University of Illinois as a result of ICCI-funded research programs, have been licensed by the University to a new company, Dynamic Separations, Inc., which will pursue its development and marketing to industry. The company has leased space in a building in downtown Champaign where ISGS and company researchers will pursue work on demonstrating the technologies at the full industrial scale at two coal mines in Illinois. The demonstrations are supported by grants to the University of Illinois from the Illinois Clean Coal Institute in partnership with coal companies and Dynamic Separations, Inc.

ISGS scientists recently used ash from a fluidized bed combustion furnace to make test blocks of autoclaved aerated concrete (AAC). They found that, with the correct formulation,

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high-quality AAC could be made with the ash as a major ingredient. The scientists recently met with representatives of Southern Illinois Power Cooperative (SIPC), the source of the ash used in the tests, to discuss prospects of using ash from the plant at a proposed new factory that will make AAC building materials. If most of the plant's ash was consumed by the new AAC plant, SIPC could save approximately $800,000 per year in ash disposal costs.

And finally, Illinois' nonfuel mineral industries will be faced with several challenging issues in the coming years: the need for adequate government funding for continued transportation infrastructure improvements, solving the problem of supplying aggregate for the rapidly growing Chicago and Metropolitan East Saint Louis areas, resolving the conflicting public demands for protecting the environment and exploiting needed resources, and dealing with the increasing opposition to mining from the public. The repair and maintenance of the highway system requires local availability of high-quality aggregate. With aggregate comprising approximately 80% of concrete pavements and more than 90% of asphalt, durable aggregate will continue to be in high demand throughout the State for years to come.

Legislation and Government Programs

On the Federal level, efforts focused on the reauthorization of TEA-21—the Federal highway program. This legislation is critical for much needed maintenance and repair of Federal highways and is a major source of demand for the State's crushed stone and sand and gravel aggregate. Congress did not pass a new Federal highway bill in 2004. Prior to adjournment of the fall session, Congress extended TEA 21 for 8 months, until May 31, 2005. It was a clean extension without earmarked projects. The U.S. House of Representatives then adjourned until November 16, 2004, when Congress returned to complete action on outstanding legislation, primarily FY 2005 spending bills. Thus, reauthorization of TEA 21 was not expected to take place until the new Congress convenes in 2005.

However, the House and Senate did pass a new corporate tax bill that includes provisions to increase revenues into the Highway Trust Fund by approximately $24 billion between FY 2005 and FY 2010. The legislation eliminates the existing 5.2 cents per gallon motor fuel tax exemption for ethanol and replaces it with a general fund tax credit. The bill also redirects the 2.5 cents per gallon ethanol tax currently going into the general fund to the highway trust fund. Both ethanol measures would become permanent upon signature by the President, who is expected to sign the bill. These specific provisions provide an important boost to highway trust fund revenues on the national level and are particularly important to Illinois, where a substantial percentage of ethanol is sold and produced.

On the State level, several issues were of concern to the industry. The Governor's Office of Management and Budget (GOMB) transfer authority was eliminated for FY 2005 and beyond. This transfer authority had the potential to spend more than $140 million a year from road funds to the general revenue fund (GRF). Fifty million dollars was transferred from the road fund to GRF in FY 2004. Intense lobbying by the IAAP and other interested parties was underway to eliminate future diversions from the road funds. Upon the elimination of the GOMB's transfer authority, the base FY 2005 highway capital program was increased by $261 million to $1.5 billion.

The Governor's proposed FY 2005 State Budget expanded the State Motor Fuel Tax (MFT) to include fuel used by nonfarm, off-road vehicles and equipment. This proposal would have cost the aggregates industry more than $6 million annually and thereby add roughly 6 cents a ton to the costs of producing crushed stone and sand and gravel in Illinois. It would also have had a serious economic impact on Illinois' coal mines, construction companies, and railroads. Lobbying by the Illinois Coalition for Fair Fuel Taxes, a coalition composed of Illinois aggregate, coal mining associations and their allies in organized labor, construction, and railroads, resulted in this proposed new tax being "taken off the table" during budget negotiations. The Illinois General Assembly also blocked a tax hike on farm chemicals that might have affected the cost of agricultural lime.

Legislation was introduced during the spring 2004 legislative session that would allow local units of government to operate their own (more stringent) wetlands programs and would allow the State to set permit fees by rule (rather than limiting the amount of fees that may be charged). The industry opposed this legislation, primarily because of its concern about the impact of wetlands requirements imposed at the local level, and the legislation did not pass the Illinois General Assembly.

Reference Cited

American Iron and Steel Institute, 2005, Pig iron and raw steel production-Final 2004, AIS-7, subsection of annual statistical report 2004: Washington, DC, American Iron and Steel Institute, 130 p.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ILLINOIS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	2,770	204,000 e	2,930	210,000 e	3,010	233,000 e
Clays:						
Common	181	856	179	1,010	247	1,390
Fuller's earth	W	W	W	W	218	W
Gemstones	NA	28	NA	28	NA	70
Sand and gravel:						
Construction	32,000	146,000	34,600	161,000	38,700	203,000
Industrial	4,510	72,800	4,440	72,600	4,950	86,200
Stone, crushed[3]	75,200	431,000	76,000	453,000	76,500	465,000
Combined values of lime, peat, stone (crushed sandstone), tripoli, and values indicated by symbol W	XX	62,100	XX	74,000	XX	65,400
Total	XX	917,000	XX	971,000	XX	1,050,000

eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ILLINOIS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	114 r	60,500 r	$346,000 r	$5.72	104	54,600	$314,000	$5.76	112	56,300	$335,000	$5.96
Dolomite	15 r	14,600 r	84,700 r	5.79 r	18	21,300	138,000	6.45	18	20,200	130,000	6.43
Sandstone	1	W	W	W	1	W	W	W	1	W	W	W
Miscellaneous stone	--	--	--	--	(3)	106	833	7.87	--	--	--	--
Total	XX	75,200	431,000	5.73	XX	76,000	453,000	5.96	XX	76,500	465,000	6.08

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.
[3]Sales/distribution yards.

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TABLE 3a

ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	2,490	$16,800	$6.76
Riprap and jetty stone	1,610	18,800	11.67
Filter stone	1,690	10,400	6.11
Other coarse aggregates	678	3,530	5.21
Total or average	6,470	49,500	7.65
Coarse aggregate, graded:			
Concrete aggregate, coarse	10,000	75,500	7.54
Bituminous aggregate, coarse	5,450	44,100	8.08
Bituminous surface-treatment aggregate	2,460	20,400	8.29
Railroad ballast	754	4,790	6.35
Other graded coarse aggregates	730	3,910	5.35
Total or average	19,400	149,000	7.66
Fine aggregate (-¾ inch):			
Stone sand, concrete	1,770	9,410	5.32
Stone sand, bituminous mix or seal	1,410	7,620	5.41
Screening, undesignated	1,850	5,930	3.20
Other fine aggregates	1,900	8,550	4.50
Total or average	6,930	31,500	4.55
Coarse and fine aggregates:			
Graded road base or subbase	15,000	75,400	5.02
Unpaved road surfacing	1,920	10,800	5.63
Crusher run or fill or waste	1,680	8,740	5.19
Roofing granules	W	W	14.18
Other coarse and fine aggregates	1,910	8,690	4.54
Total or average	20,600	104,000	5.04
Other construction materials	817	6,420	7.85
Agricultural:			
Limestone	1,800	6,530	3.62
Poultry grit and mineral food	117	618	5.26
Other agricultural uses	1	6	6.00
Total or average	1,920	7,160	3.73
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	7.15
Lime manufacture	(2)	(2)	4.96
Dead burned dolomite	(2)	(2)	5.51
Flux stone	(2)	(2)	5.51
Total or average	2,530	16,400	6.50
Special:			
Asphalt fillers or extenders	(2)	(2)	5.51
Whiting or whiting substitute	(2)	(2)	15.16
Other fillers or extenders	(2)	(2)	5.51
Total or average	1,030	6,070	5.90
Other miscellaneous uses and specified uses not listed	1	41	41.00
Unspecified:[3]			
Reported	5,060	27,400	5.41
Estimated	12,600	60,300	4.77
Total or average	17,700	87,600	4.96
Grand total or average	76,000	453,000	5.96

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	2,520	$17,200	$6.82
Riprap and jetty stone	1,870	20,300	10.84
Filter stone	1,640	10,500	6.37
Other coarse aggregates	481	3,390	7.05
Total or average	6,520	51,300	7.88
Coarse aggregate, graded:			
Concrete aggregate, coarse	9,980	74,100	7.42
Bituminous aggregate, coarse	5,790	47,200	8.15
Bituminous surface-treatment aggregate	3,010	24,100	8.01
Railroad ballast	726	4,700	6.48
Other graded coarse aggregates	1,540	7,300	4.73
Total or average	21,000	157,000	7.48
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,770	9,330	5.26
Stone sand, bituminous mix or seal	1,260	7,120	5.66
Screening, undesignated	2,340	8,080	3.45
Other fine aggregates	253	2,290	9.04
Total or average	5,630	26,800	4.77
Coarse and fine aggregates:			
Graded road base or subbase	13,700	70,800	5.19
Unpaved road surfacing	2,390	13,800	5.76
Crusher run or fill or waste	1,520	7,920	5.21
Roofing granules	W	W	15.41
Other coarse and fine aggregates	986	5,750	5.83
Total or average	18,500	98,300	5.30
Agricultural:			
Limestone	2,220	7,880	3.56
Poultry grit and mineral food	(2)	(2)	21.29
Other agricultural uses	28	553	19.75
Total or average	2,250	8,440	3.76
Chemical and metallurgical:			
Cement manufacture	(3)	(3)	9.32
Dead burned dolomite	(3)	(3)	5.51
Flux stone	(3)	(3)	5.51
Total or average	2,440	19,700	8.08
Special:			
Asphalt fillers or extenders	(3)	(3)	5.51
Whiting or whiting substitute	(3)	(3)	17.54
Other fillers or extenders	(3)	(3)	5.37
Total or average	1,620	9,130	5.65
Other miscellaneous uses and specified uses not listed	22	223	10.14
Unspecified:[4]			
Reported	6,660	35,400	5.32
Estimated	12,000	58,000	4.96
Total or average	18,400	93,600	5.09
Grand total or average	76,500	465,000	6.08

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[3]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	4,770	37,600	W	W	554	4,490	W	W
Coarse aggregate, graded[3]	13,200	103,000	W	W	3,250	25,000	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	751	3,620	W	W
Coarse and fine aggregates[5]	13,600	67,100	W	W	3,550	18,800	W	W
Other construction materials	715	5,780	--	--	8	33	95	603
Agricultural[6]	516	1,170	286	1,170	630	3,260	490	1,560
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	W	W	W	W	W	W	W	W
Other miscellaneous uses and specified uses not listed	1	41	--	--	--	--	--	--
Unspecified:[9]								
Reported	9	59	--	--	419	2,450	4,630	24,800
Estimated	2,780	14,200	3,130	16,200	2,590	12,000	4,120	17,900
Total	41,500	258,000	5,350	30,200	13,600	82,500	15,600	81,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded aggregates.

[4]Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement and lime manufacture, dead burned dolomite, and flux stone.

[8]Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	4,710	37,100	711	5,870	706	5,500	391	2,920
Coarse aggregate, graded[3]	12,400	97,300	672	5,480	4,660	34,500	3,270	20,100
Fine aggregate (-¾ inch)[4]	4,080	19,500	355	1,800	957	4,450	239	1,080
Coarse and fine aggregates[5]	11,800	60,800	997	5,650	3,650	20,000	2,110	11,800
Agricultural[6]	484	1,730	W	W	W	W	687	1,850
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	W	W	W	W	W	W	--	--
Other miscellaneous uses and specified uses not listed	22	223	--	--	--	--	--	--
Unspecified:[9]								
Reported	1,460	7,450	--	--	--	--	5,200	27,900
Estimated	5,200	28,000	1,400	7,200	1,400	5,900	3,800	17,000
Total	41,800	261,000	5,260	31,500	13,800	89,700	15,700	82,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded aggregates.

[4]Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement manufacture, dead burned dolomite, and flux stone.

[8]Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5a

ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,330	$39,700	$4.77
Plaster and gunite sands	466	2,020	4.34
Concrete products (blocks, bricks, pipe, decorative, etc.)	418	1,970	4.72
Asphaltic concrete aggregates and other bituminous mixtures	1,560	8,410	5.38
Road base and coverings[2]	4,660	26,100	5.60
Fill	2,330	9,930	4.27
Snow and ice control	54	454	8.38
Other miscellaneous uses[3]	83	603	7.30
Unspecified:[4]			
Reported	9,080	37,900	4.17
Estimated	7,600	34,000	4.45
Total or average	34,600	161,000	4.65

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road and other stabilization (cement and lime).

[3]Includes roofing granules.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 5b
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,910	$54,900	$5.54
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	789	3,230	4.09
Asphaltic concrete aggregates and other bituminous mixtures	4,400	27,700	6.29
Road base and coverings[3]	4,790	31,900	6.66
Fill	1,900	8,860	4.66
Snow and ice control	18	138	7.59
Other miscellaneous uses[4]	51	362	7.11
Unspecified:[5]			
Reported	8,830	36,900	4.18
Estimated	8,000	39,000	4.88
Total or average	38,700	203,000	5.25

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes filtration and roofing granules.
[5]Reported and estimated production without a breakdown by end use.

TABLE 6a
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	3,530	17,700	1,260	5,630	1,940	9,710
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	344	1,790
Asphaltic concrete aggregates and other bituminous mixtures	662	3,300	42	211	730	4,520
Road base and coverings[3]	2,610	14,500	338	1,500	1,110	6,910
Fill	926	4,300	465	1,530	691	3,170
Snow and ice control	21	120	W	W	33	330
Other miscellaneous uses[4]	178	838	334	1,350	28	234
Unspecified:[5]						
Reported	7,300	31,000	730	2,910	1,050	3,970
Estimated	4,500	20,000	620	2,700	1,900	8,400
Total	19,700	91,700	3,780	15,800	7,840	39,000

	District 4	
Use	Quantity	Value
Concrete aggregate (including concrete sand)	1,560	6,240
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	79	342
Asphaltic concrete aggregates and other bituminous mixtures	130	374
Road base and coverings[3]	540	2,550
Fill	227	818
Snow and ice control	W	W
Other miscellaneous uses[4]	3	20
Unspecified:[5]		
Reported	--	--
Estimated	620	2,900
Total	3,160	13,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes roofing granules.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b

ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	3,150	17,600	1,090	5,300	3,810	24,700
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	400	1,930
Asphaltic concrete aggregates and other bituminous mixtures	1,130	5,330	W	W	3,210	22,100
Road base and coverings[3]	2,350	16,700	277	1,390	1,850	12,100
Fill	754	4,590	290	1,080	636	2,500
Snow and ice control	W	W	W	W	7	50
Other miscellaneous uses[4]	231	881	245	853	7	56
Unspecified:[5]						
Reported	6,760	28,500	872	3,690	1,200	4,720
Estimated	3,900	18,000	930	4,100	2,400	13,000
Total	18,200	91,400	3,700	16,400	13,500	81,500

Use	District 4		Unspecified district	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,510	6,240	345	1,070
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--
Road base and coverings[3]	319	1,690	--	--
Fill	222	681	--	--
Snow and ice control	--	--	--	--
Other miscellaneous uses[4]	33	254	--	--
Unspecified:[5]				
Reported	--	--	--	--
Estimated	870	3,900	--	--
Total	2,960	12,700	345	1,070

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration and roofing granules.

[5]Reported and estimated production without a breakdown by end use.

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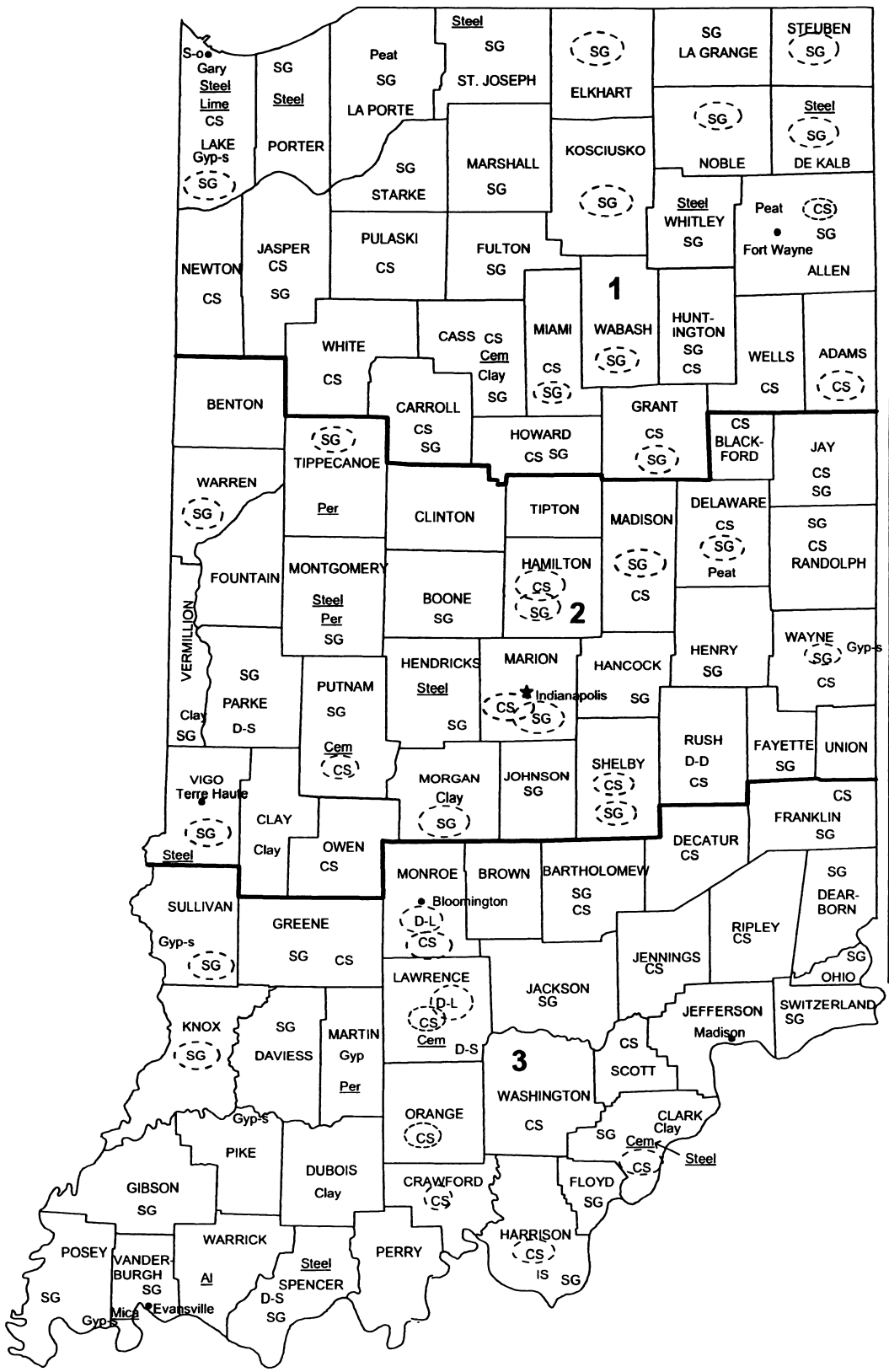
INDIANA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-D	Dimension dolomite
D-L	Dimension limestone
D-S	Dimension sandstone
Gyp	Gypsum
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Mica	Mica plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
(dashed)	Concentration of mineral operations

Source: Indiana Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF INDIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Indiana Geological Survey for collecting information on all nonfuel minerals.

In 2004, Indiana's nonfuel raw mineral production[1] was valued at $764 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 7% increase of $49 million from that of 2003[2] and followed a 2.5% decrease, from 2002 to 2003. The State was 22d in rank (20th in 2003) among the 50 States in total nonfuel raw mineral production value, of which Indiana accounted for about 1.7% of the U.S. total.

In 2004, for the second consecutive year, cement (portland and masonry), by value, was Indiana's leading nonfuel mineral commodity, followed by crushed stone, construction sand and gravel, and lime. (For more than a decade prior to 2003, crushed stone had been the State's leading nonfuel mineral commodity.) The combined values of these four mineral commodities accounted for nearly 92% of the State's total nonfuel value. Increases in the values of crushed stone (up $16 million), portland cement (up $15 million), lime (up nearly $13 million), and masonry cement in 2004 led the State's increase in total value for the year. Smaller yet significant increases also took place in dimension stone and gypsum (descending order of value). The only decrease in value was that of construction sand and gravel (down $13 million) (table 1).

In 2003, Indiana's decrease in nonfuel mineral value mostly resulted from decreases in the production and values of crushed stone (down $31 million) and masonry cement, and less so from decreases in the values of gypsum, industrial sand and gravel, and common clays. These were countered, in part, by the rising values of construction sand and gravel (up $7 million) portland cement (up $6 million), lime (up about $6 million), and dimension stone (up $2.6 million) (table 1).

In 2004, Indiana continued to be first in the quantity of dimension stone produced as compared with other producing States, seventh in gypsum, eighth in lime, and ninth in portland cement. The State was among the top four masonry cement-producing States and it decreased to sixth from fifth in the production of peat. Additionally, Indiana was a significant producer of crushed stone and construction sand and gravel, ranking 11th and 15th, respectively. The State's mines produced exclusively industrial minerals and coal; all raw steel and primary aluminum produced in the State were processed from materials received from other domestic and foreign sources. Indiana continued to lead the Nation in the production of raw steel, with an estimated output of about 24.8 million metric tons of raw steel, as reported by the American Iron and Steel Institute (2005, p. 76). Based upon USGS annual data, the State rose to second from third in the production of primary aluminum.

The following narrative information was provided by the Indiana Geological Survey[3] (IGS).

Employment

Approximately 3,564 individuals were employed in Indiana's nonfuel sector during 2004; this represents an increase of 1% from 2003 employment figures, according to the U.S. Department of Labor, Mine Safety and Health Administration (MSHA).

Commodity Review

Industrial Minerals

Cement.—The Lone Star Industries, Inc. and Buzzi Unicem USA, Inc. merger was completed by January 1, 2005, and Lone Star Industries, Inc. has changed its name to Buzzi Unicem USA, Inc. The company operated a plant in Putnam County, IN, and a plant in Texas.

Clay and Shale.—Unimin Corporation, which in recent years, had purchased its raw materials, opened a captive shale pit near Jasper in Dubois County. The company is still producing processed clay but is no longer producing fine-ground limestone or talc. Brickcraft LLC opened a brick plant in Clay County and is mining its own shale from a pit behind the plant. The abandoned Medora Brick Company plant in Jackson County was named as one of the top 10 most endangered landmarks in Indiana by the Historic Landmarks Foundation of Indiana.

Crushed Stone.—Ward Stone Company began production at its new Dinn Quarry in Shelby County. At existing dimension limestone quarries, overburden to produce aggregate has increased in recent years. During 2004, BTI Crushed Stone Sales, Inc. began crushing stone overburden for the Victor Oolitic Stone Company, and S & G Excavating, Inc. began a similar operation for the American Limestone LLC Stinesville Quarry; both operations are in Monroe County. Several other dimension stone quarries crush overburden for their own use or for local distribution. No company acquisitions or mergers took place in the Indiana crushed stone industry during 2004. Hanson Aggregates Midwest received permission to expand its Fort Wayne quarry in Allen County by an additional 49 hectares (ha), which will probably assure an additional 50 years of production at this locality. Quarry shots will be limited

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Kathryn R. Shaffer, Minerals Statistician, authored the text of State mineral industry information provided by the Indiana Geological Survey.

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to two per day because of its proximity to a residential area. The company's Harding Street underground mine is currently inactive, but the company is still producing from the surface quarry. Barrett Paving Materials, Inc. will also expand its quarry near Richmond in Wayne County by 11 ha; however, they must obtain a $50,000 performance bond and meet other conditions. Mulzer Crushed Stone, Inc. is using a hydraulic material handler to load barges at its Ohio River operations. Liter's Quarry, Inc.'s underground mine in Clark County was currently inactive. Parker Brothers Stone and Gravel Corp. in Putnam County ceased production during the year. Marengo Quarry, an abandoned crushed stone quarry in Crawford County currently used as a warehouse, the Marengo Warehouse and Distribution Center, may also become the site of a biotech lab that grows bioengineered crops for the pharmaceutical industry. Cross-contamination with other pollens will probably be prevented by growing the plants underground (Heikens, 2004). The McAlpine lock was closed for repairs on the Ohio River, stopping barge traffic for 2 weeks in August.

Dimension Stone.—The Indiana dimension stone industry has been fairly stable for several years, but some overall improvement in market sales is expected in concert with the upswing in the U.S. economy. Several companies reported that they are being kept very busy (Schroeder, 2004). The Big Creek, LLC quarry, under development in 2003, was in full production during 2004, and is located near Stinesville in Monroe County. The company holds 138 ha. The Indiana Limestone Company was expanding the Empire Quarry, from which stone was excavated for the Empire State Building in New York City, NY. The quarry closed after completion of that job, but reopened in 1998 to provide stone for repairs to the Empire State Building. It is part of the company's PMB quarry complex near Bedford in Lawrence County. Victor Oolitic Stone Company supplied limestone for the restoration of the Barclay-Vesey Building at Ground Zero in New York. The Marble Institute of America awarded a Restoration Award of Merit under its Pinnacle Awards program for the project. Limestone Material Supply LLC, Luttrell & Galloway Quarry, was listed as abandoned during 2004. The quarry, which was open for only 2 years, produced intermittently. Plans are also being made to restore the long-abandoned Woolery Stone Mill in Bloomington, Monroe County, for tourism. The development will include condominiums, a hotel, a rock climbing facility, and a restaurant. The $6 million project is designed to attract Bloomington area tourism, and it received a tax abatement from the city.

Dimension sandstone is also produced in Indiana. Mansfield Stone, Inc. temporarily closed its sandstone quarry in Parke County and began redevelopment of the St. Meinrad sandstone quarry on property owned by the St. Meinrad Archabbey in Spencer County. The company plans to reopen and to expand the Parke County quarry in 2005.

Gypsum.—National Gypsum, which operates a gypsum mine at Shoals in Martin County, is opening a cement backer board plant at Clinton in Vermillion County under the name Unifix, Inc.

Sand and Gravel.—Five sand and gravel companies received MSHA identification numbers during the year, and all were in production at yearend. New operations include Parr Excavating in Sullivan County, White Sand & Gravel, Inc. in Marion County, and Greenfield Gravel, Inc. in Hancock County. In addition, Stonehenge Concrete Company, Inc. closed a pit north of Modoc in Randolph County and opened a new one about 14 kilometers south. Julian Earthwork, Inc. closed a plant in Steuben County and opened another in the area and named it the Creek Bank Road Pit. Nine known pit closures were reported. Significant among them were Harrison Sand & Gravel Company, Inc.'s Brookville Pit in Franklin County, which had operated since 1979, and St. Henry Tile Company, Inc.'s Limberlost Sand and Gravel in Adams County, which had operated since 1982. Irving Gravel Company, Inc. also closed its Auburn Pit. The Edward C. Levy Co., Inc. has stopped production of sand and gravel at its two pits in St. Joseph County and is now exclusively processing and selling crushed slag. County Stone is operating the former Kirk Materials pit in De Kalb County. R.L.R. Materials, Inc. acquired Sandy Ridge Materials in Lake County. Rogers Group, Inc. purchased the Abram & Hawkins Excavating Co., Inc.'s plant in Sullivan County and renamed it Graysville Sand & Gravel. The plant received a First Step Award, and the company's Greene County Plant earned an Outstanding Achievement Award as part of the National Stone, Sand and Gravel Association's (NSSGA) About Face Program. In addition, the company's Morgan County Sand & Gravel received a NSSGA Certificate of Achievement for Community Relations, and its interstate sand and gravel operation in Warren County achieved 1,700 days without any injuries.

Mastodon skull, teeth, and bones were found during excavation at a stockyard for the Irving Materials, Inc.'s Kewanna Plant in Fulton County. The company worked with the Indiana State Museum to recover the fossils.

Crisman Sand Co., Inc. is no longer producing industrial sand but is preparing to produce construction grade sand from a pit in Porter County.

Metals

Steel.—Steel prices increased overall this year. The price of scrap metal was high and decreased to some extent the primary advantage that minimills have over integrated steel producers. Surcharges were added to steel prices to compensate for increased costs. Coke supplies were also low, driving the price up to record levels. Improvement in the shortage of steel scrap and coke is not expected before at least 2006 (Holecek, 2004§[4]).

Ispat International acquired LNM Holdings to form Mittal Steel Company NV. The new company also announced that it would merge with the International Steel Group (ISG). The merger will make the international company the top steel producer in the world. ISG also closed its Port of Indiana Chicago Cold Rolling plant acquired from the holdings of Bethlehem Steel Corp., but moved all United Mine Workers of America (UMWA) employees to its Burns Harbor cold-rolling mill and considered employees with management experience for other positions within ISG. East Chicago awarded ISG with a

[4]A reference that includes a section mark (§) is found in the Internet References Cited section.

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$23.1 million tax abatement during the next 10 years, retroactive to 2003, because of company expenses in 2003 and discussed an additional $20 million tax abatement, also during the next 10 years, on improvements made during 2004. ISG planned to acquire and reopen an LTV Corp. coke plant in Chicago; the plant will need extensive repairs.

Ispat Inland demolished two blast furnaces that had been unused for 12 years. The 11,000 metric tons of scrap steel in those blast furnaces was recycled. The company eliminated 130 salaried employees—10% of its work force—at the Indiana Harbor Works to make the company more competitive. The company relined its No. 7 furnace last year and, as a result, was able to set a slab production record. It began some limited hiring to replace employees who have left.

U.S. Steel made a property tax settlement with Lake County by donating 81 ha of redeveloped lakefront property to the city of Gary, putting $150 million into plant improvements during a period of 4 years, paying $44 million in taxes owed for 3 years, and paying legal and other fees. The State will also pay Lake County $8.9 million in tax credits that would have come to it had the taxes been paid on time. The company will not claim a tax refund of $65 million. The 81 ha will need extensive environmental evaluation and treatment. A new Gary Waterfront Joint Authority Board will supervise the remediation and will look for sources of income to assist with the cleanup. U.S. Steel Corp. made two blast furnace repairs at its Gary Works. About 925 employees who lost health insurance benefits as part of National Steel's bankruptcy proceedings will receive coverage under the UMWA Funds 1992 Benefit Plan. The company was acquired by U.S. Steel in 2003. U.S. Steel anticipates further employments cuts.

Along with the 81 ha of lakefront property from U.S. Steel for a major lakefront development project on Lake Michigan, the city of Gary will also receive the abandoned Lehigh Cement Company Buffington Station land as well. The city will also acquire the land occupied by Northern Indiana Public Service Company's abandoned Mitchell electric plant for this project. A feasibility study for the planned development will be conducted. Electric rates for steel mills have increased because of the closing of the electric plant and could go higher.

Steel Dynamics, Inc. experienced record production and sales in 2003. Renovations were completed on the Qualitech Steel mill at Pittsboro in Hendricks County; the plant was acquired last year and was restarted as Steel Dynamics Inc.'s Structural Bar Division. Expansion is still underway at that mill, but it is showing profitability. The company's Iron Dynamics plant at Butler began liquid pig iron production. The company, along with Cleveland-Cliffs Inc and Kobe Steel, may open a new Butler plant that would produce an iron nugget raw material that can substitute for pig iron at about one-half the cost. Steel Dynamics may also construct a new mill at Columbia City to weld the railroad rails produced at Columbia City into longer lengths of rail, up to 490 meters long; such long segments would require less maintenance by railroad companies.

Nucor Corporation experienced increased profits in 2004 that were attributed to increased demand, a raw materials surcharge to offset the high cost of scrap metal, and improvements in production and decreased costs at new facilities. The company's new Castrip facility was proving to be productive and profitable.

Twelve steel-processing plants, with the prospects of more, operated at the Clark Maritime Centre at Jeffersonville; many of them primarily serve the auto industry.

Environmental Issues

The Indiana Department of Environmental Management (IDEM) Web site at URL http://www.IN.gov/idem/rules includes a list of all State environmental rules and tracks changes to them. IDEM is participating in the new National Environmental Information Exchange Network that will allow real-time data sharing. Indiana University and the Indiana Geological Survey will receive $50,000 from an IDEM grant to investigate the use of waste tire material as a substitute for aggregate in onsite sewage distribution fields. The Indiana Department of Transportation (INDOT) is working in cooperation with other States to create an electronic system to report on air quality.

Indiana aggregate producers won several awards in 2004. During its Environmental Eagle Awards Program, the National Stone & Gravel Association gave Hanson Aggregates Midwest Versailles Quarry the Silver Award for medium-sized operations. They also awarded Hanson Aggregates Midwest Aggrock Quarry a Showplace Award in its About Face Program. Hanson Aggregates Midwest; Irving Materials, Inc.; Rogers Group, Inc.; and U.S. Aggregates were awarded Gold Awards at the 2004 Indiana Mineral Aggregates Association's "Excellence in Mining" Awards Program, which recognizes companies for exemplary environmental programs, safety activities, and employee and community relations.

Government Programs

The Evansville-to-Indianapolis corridor of the I-69 extension project received Federal approval. Studies are underway to determine the exact path of the highway.

The Indiana State Legislature passed legislation that redefined certain wetland terms. The legislation ranks wetlands into three classes and also contains revisions to the IDEM permitting process relating to wetlands. Indiana also passed legislation that provides for the licensing of those who handle explosives, and State rules will be written to govern the use of regulated explosives. This law excludes coal mining, which is covered under existing laws. INDOT is working on electronic reporting methods to reduce the amount of paper that is generated.

A Carmel city ordinance put in place during 2003 to prevent the expansion of the Martin Marietta Aggregates' Carmel Sand & Gravel pit, north of 106 Street in Indianapolis, Marion County, near a residential and commercial area, was withdrawn because of litigation by Martin Marietta Aggregates. The Carmel ordinance is being revised. In recent years, a number of sand and gravel operations have been opened in Morgan County. In response, the Morgan County Commissioners passed an ordinance that places controls over new operations and those wishing to expand. It does not apply to existing operations. The

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new ordinance has stopped at least one company's plans to open a new plant in that county.

MSHA presented safety awards to 122 companies at an Indiana Mineral Aggregates Association meeting; a combined 450 years were worked by these companies without a lost-time injury.

USGS-funded STATEMAP projects continued at the IGS. The IGS released numerous publications of interest to the mining industry during 2004 including a report on a new slow-logging technique for unconsolidated materials (Bleuer, 2004, 39 p.) and geologic maps of the Wabash 30 x 60-Minute Quadrangle (Hasenmueller, 2004; Hasenmueller and James, 2004). Also available through the IGS is a book about the lives of some Indiana dimension limestone carvers (Ferrucci, 2004, 82 p.). A new Directory of Industrial Mineral Producers in Indiana is in press and will be available in 2005. To acquire copies or to obtain further geologic information, contact the IGS by phone (812-855-7636) or on its Web site at URL http://igs.indiana.edu.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN INDIANA[1,2]

(Thousand metric tons and thousand dollars)

	2002		2003		2004	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	2,940	197,000 e	2,930	203,000 e	3,080	218,000 e
Clays, common	429 r	1,240 r	385	767	729	1,890
Gemstones	NA	4	NA	4	NA	4
Sand and gravel, construction	27,600	122,000	32,900	129,000	28,300	116,000
Stone:						
Crushed	55,500	268,000	50,500	237,000	56,800	253,000
Dimension	237	39,500	242	42,100	251	45,500
Combined values of cement (masonry), clays (ball), gypsum (crude), lime, peat, sand and gravel (industrial)	XX	104,000	XX	104,000	XX	130,000
Total	XX	733,000 r	XX	716,000	XX	764,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
INDIANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2002				2003				2004			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	69 r	45,500 r	$222,000 r	$4.87	71	43,100	$191,000	$4.43	74	48,900	$212,000	$4.33
Dolomite	17 r	W	W	4.65 r	17	7,390	45,900	6.21	18	7,900	41,600	5.27
Slate	1	W	W	6.06	--	--	--	--	--	--	--	--
Total or average	XX	55,500	268,000	4.83	XX	50,500	237,000	4.69	XX	56,800	253,000	4.46

rRevised. XX Not applicable. W Withheld to avoid disclosing company proprietary data. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	284	$2,070	$7.30
Riprap and jetty stone	416	2,360	5.67
Filter stone	229	1,400	6.11
Other coarse aggregates	655	2,840	4.33
Total or average	1,580	8,670	5.47
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,910	19,300	6.65
Bituminous aggregate, coarse	1,230	9,150	7.47
Bituminous surface-treatment aggregate	1,460	13,200	9.04
Railroad ballast	323	1,790	5.54
Other graded coarse aggregates	5,540	19,300	3.48
Total or average	11,500	62,800	5.48
Fine aggregate (-¾ inch):			
Stone sand, concrete	44	224	5.09
Stone sand, bituminous mix or seal	371	2,400	6.46
Screening, undesignated	112	504	4.50
Other fine aggregates	2,110	7,040	3.33
Total or average	2,640	10,200	3.85
Coarse and fine aggregates:			
Graded road base or subbase	3,130	18,300	5.83
Unpaved road surfacing	772	4,150	5.37
Crusher run or fill or waste	670	3,500	5.23
Roofing granules	W	W	5.51
Other coarse and fine aggregates	2,620	14,510	5.54
Total or average	7,190	40,400	5.62
Other construction materials	25	204	8.16
Agricultural:			
Limestone	2,030	8,050	3.96
Poultry grit and mineral food	(2)	(2)	3.31
Chemical and metallurgical:			
Cement manufacture	4,140	10,600	2.53
Dead burned dolomite	(3)	(3)	5.51
Flux stone	(3)	(3)	6.65
Sulfur oxide removal	(3)	(3)	3.31
Total or average	4,890	13,300	2.71
Special, whiting or whiting substitute	(2)	(2)	4.08
Unspecified:[4]			
Reported	17,300	77,800	4.51
Estimated	3,200	15,000	4.59
Total or average	20,400	92,400	4.52
Grand total or average	50,500	237,000	4.69

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[3]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b

INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	193	$1,320	$6.83
Riprap and jetty stone	405	2,550	6.31
Filter stone	93	561	6.03
Other coarse aggregates	1,430	4,900	3.42
Total or average	2,120	9,330	4.40
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,130	13,000	6.12
Bituminous aggregate, coarse	1,110	7,580	6.81
Bituminous surface-treatment aggregate	615	4,840	7.87
Railroad ballast	428	2,430	5.69
Other graded coarse aggregates	3,980	13,900	3.50
Total or average	8,260	41,800	5.06
Fine aggregate (-⅜ inch):			
Stone sand, concrete	39	223	5.72
Stone sand, bituminous mix or seal	298	1,820	6.12
Screening, undesignated	137	622	4.54
Other fine aggregates	2,170	7,290	3.37
Total or average	2,640	9,960	3.77
Coarse and fine aggregates:			
Graded road base or subbase	2,650	15,700	5.90
Unpaved road surfacing	798	4,310	5.40
Crusher run or fill or waste	301	1,560	5.17
Other coarse and fine aggregates	1,770	9,260	5.24
Total or average	5,520	30,800	5.58
Other construction materials[2]	61	411	6.74
Agricultural:			
Limestone	880	4,100	4.66
Poultry grit and mineral food	W	W	3.47
Chemical and metallurgical:			
Cement manufacture	(3)	(3)	3.87
Flux stone	(3)	(3)	6.89
Sulfur oxide removal	(3)	(3)	3.37
Total or average	1,770	6,460	3.66
Special, whiting or whiting substitute	W	W	3.42
Unspecified:[4]			
Reported	30,500	129,000	4.22
Estimated	4,700	21,000	4.41
Total or average	35,200	149,000	4.24
Grand total or average	56,800	253,000	4.46

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes pipe bedding.

[3]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	530	3,210	152	1,050	903	4,400
Coarse aggregate, graded[3]	3,130	20,600	1,780	13,600	6,560	28,600
Fine aggregate (-⅜ inch)[4]	275	1,540	161	981	2,200	7,650
Coarse and fine aggregates[5]	W	W	W	W	W	W
Other construction materials	--	--	25	204	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	W	W
Special[8]	--	--	--	--	W	W
Unspecified:[9]						
Reported	3,160	14,500	9,510	45,200	4,580	18,100
Estimated	1,100	4,800	490	2,200	1,600	7,500
Total	11,800	62,200	15,500	77,900	23,200	96,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes agricultural limestone and poultry grit and mineral food.

[7]Includes cement manufacture, dead burned dolomite, flux stone, and sulfur oxide removal.

TABLE 4b

INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	1,920	12,200	1,630	11,400	4,710	18,200
Fine aggregate (-⅜ inch)[4]	241	1,270	159	927	2,240	7,660
Coarse and fine aggregates[5]	1,590	7,820	1,920	12,500	2,010	10,400
Other construction materials[6]	--	--	61	411	--	--
Agricultural[7]	W	W	W	W	W	W
Chemical and metallurgical[8]	W	W	--	--	W	W
Special[9]	--	--	--	--	W	W
Unspecified:[10]						
Reported	6,520	29,400	14,700	64,200	9,210	34,900
Estimated	1,700	7,600	260	1,100	2,700	12,000
Total	13,200	64,200	19,000	92,200	24,600	96,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes pipe bedding.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes cement manufacture, flux stone, and sulfur oxide removal.

[9]Includes whiting or whiting substitute.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	11,400	$42,800	$3.75
Plaster and gunite sands	22	258	11.71
Concrete products (blocks, bricks, pipe, decorative, etc.)	588	3,360	5.71
Asphaltic concrete aggregates and other bituminous mixtures	1,630	7,550	4.62
Road base and coverings[2]	1,000	4,900	4.84
Fill	2,850	11,200	3.92
Snow and ice control	525	1,730	3.29
Other miscellaneous uses	60	527	8.85
Unspecified:[3]			
Reported	10,300	39,000	3.81
Estimated	4,500	18,000	3.91
Total or average	32,900	129,000	3.92

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,970	$36,500	$4.07
Plaster and gunite sands	22	270	12.09
Concrete products (blocks, bricks, pipe, decorative, etc.)	140	732	5.22
Asphaltic concrete aggregates and other bituminous mixtures	1,720	8,930	5.19
Road base and coverings	1,120	5,600	4.99
Road and other stabilization (cement and lime)	118	492	4.16
Fill	2,480	10,300	4.14
Snow and ice control	524	1,680	3.22
Other miscellaneous uses	46	278	6.07
Unspecified:[2]			
Reported	5,230	21,200	4.06
Estimated	7,900	30,000	3.82
Total or average	28,300	116,000	4.11

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 6a

INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,930	7,100	2,910	14,900	6,580	20,800
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	485	2,940	W	W
Asphaltic concrete aggregates and other bituminous mixtures	687	2,600	747	4,220	199	733
Road base and coverings[3]	307	1,610	600	2,720	95	561
Fill	610	2,010	2,090	8,570	153	625
Snow and ice control	118	376	380	1,280	27	73
Other miscellaneous uses	98	518	42	420	45	258
Unspecified:[4]						
Reported	1,430	6,540	8,670	31,700	159	835
Estimated	2,300	9,100	1,500	5,700	690	2,800
Total	7,510	29,800	17,400	72,400	7,940	26,700

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Reported and estimated production without a breakdown by end use.

TABLE 6b

INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,590	5,020	3,700	15,900	3,680	15,600
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	96	571	W	W
Asphaltic concrete aggregates and other bituminous mixtures	582	2,900	741	4,110	397	1,930
Road base and coverings[3]	322	1,660	763	3,470	155	956
Fill	643	2,020	1,620	7,280	214	974
Snow and ice control	W	W	439	1,450	W	W
Other miscellaneous uses	84	508	--	--	40	230
Unspecified:[4]						
Reported	418	1,890	4,650	18,700	163	645
Estimated	2,400	9,800	2,800	12,000	2,700	8,400
Total	6,130	24,000	14,800	63,600	7,340	28,800

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Reported and estimated production without a breakdown by end use.

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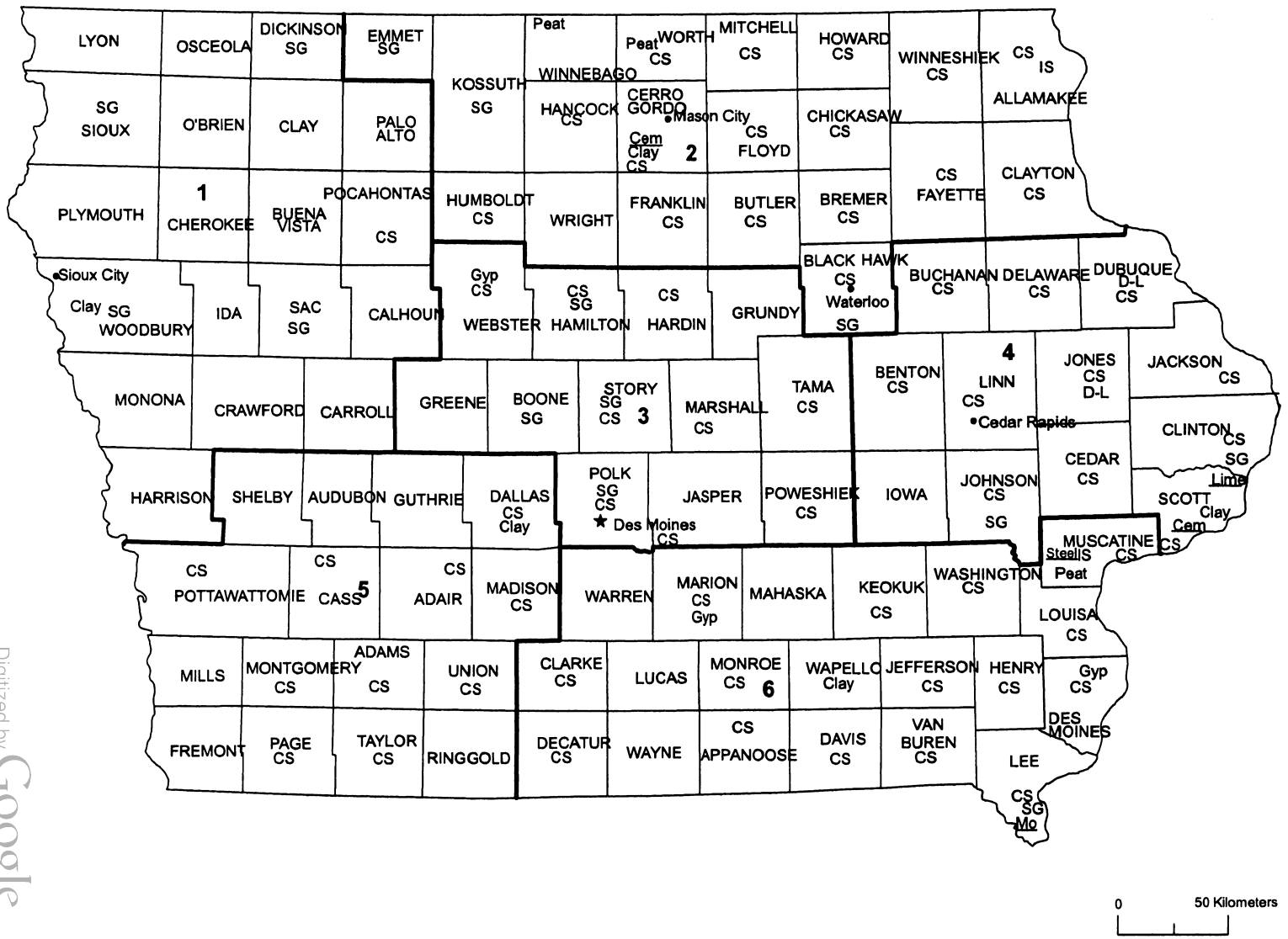
IOWA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
Gyp	Gypsum
IS	Industrial sand
Lime	Lime plant
Mo	Molybdenum plant
Peat	Peat
SG	Construction sand and gravel
Steel	Steel plant

Source: Iowa Geological Survey and Land Quality Bureau/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF IOWA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Iowa Geological Survey and Land Quality Bureau for collecting information on all nonfuel minerals.

In 2004, Iowa's nonfuel raw mineral production was valued[1] at $529 million, based upon annual U.S. Geological Survey (USGS) data. This was about a 5% increase in value from that of 2003,[2] which was up 3.3% from 2002. The State was 28th in rank (27th in 2003) among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total.

Crushed stone, cement (portland and masonry), construction sand and gravel, and gypsum (in descending order of value) were Iowa's leading nonfuel mineral commodities in 2004, accounting for about 97% of the State's total nonfuel mineral value. In 2004, most of the State's commodities showed increases in production with the related increased values of construction sand and gravel and crushed stone leading the way, up more than $13 million and $8 million, respectively. Smaller increases in value also took place in cement, up about $1.5 million, and gypsum and lime, up about $1 million each (production of cement and lime down, slightly).

In 2003, increases in the production of crushed stone, its value up $13 million, cement and lime, values up about $2 million each, and gypsum, up nearly $1 million, accounted for most of the State's rise in value. The largest decrease in value for the year was that of a slightly more than $1 million drop for construction sand and gravel (table 1).

In 2004, Iowa rose to 8th from 11th in the quantities of portland cement that its mining and cement processing operations produced, decreased to 4th from 3d in gypsum production, and continued to be a significant producer of crushed stone, construction sand and gravel, and common clays (descending order of value). No metals were mined in Iowa; all of the State's metal production, such as raw steel, resulted from the processing of materials acquired from other domestic and foreign sources.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IOWA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	256	763	256	763	325	1,150
Gemstones	NA	2	NA	2	NA	2
Sand and gravel, construction	14,600	62,300	13,400	61,000	17,100	74,300
Stone, crushed	35,900	194,000	35,600	207,000	36,800	215,000
Combined values of cement, gypsum (crude), lime, peat, sand and gravel (industrial)	XX	231,000	XX	235,000	XX	239,000
Total	XX	488,000	XX	504,000	XX	529,000

NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
IOWA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	171 r	W	W	$5.49 r	184	W	W	$5.77	159	W	W	$5.81
Dolomite	37 r	W	W	4.30 r	37	W	W	6.63	37	W	W	6.55
Total or average	XX	35.900	$194,000	5.41	XX	35,600	$207,000	5.82	XX	36,800	$215.000	5.85

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	232	$1,350	$5.83
Riprap and jetty stone	142	1,810	12.74
Filter stone	519	3,420	6.58
Other coarse aggregates	76	441	5.80
Total or average	969	7,020	7.24
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,520	13,600	8.97
Bituminous aggregate, coarse	506	3,960	7.82
Bituminous surface-treatment aggregate	186	1,240	6.69
Railroad ballast	W	W	7.50
Other graded coarse aggregates	42	361	8.60
Total or average	2,250	19,200	8.51
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	5.51
Stone sand, bituminous mix or seal	147	1,010	6.88
Screening, undesignated	238	1,000	4.21
Other fine aggregates	71	391	5.51
Total or average	456	2,400	5.27
Coarse and fine aggregates:			
Graded road base or subbase	1,360	10,400	7.63
Unpaved road surfacing	4,690	29,700	6.33
Crusher run or fill or waste	467	1,300	2.79
Roofing granules	(3)	(3)	10.29
Other coarse and fine aggregates	847	5,530	6.53
Total or average	7,370	46,900	6.37
Other construction materials[4]	289	1,700	5.89
Agricultural:			
Limestone	849	3,960	4.67
Poultry grit and mineral food	(5)	(5)	7.29
Other agricultural uses	411	2,980	7.25
Total or average	1,260	6,940	5.51
Chemical and metallurgical:			
Lime manufacture	(6)	(6)	6.66
Flux stone	(6)	(6)	6.08
Glass manufacture	(6)	(6)	13.21
Total or average	874	5,870	6.72
Special, asphalt fillers or extenders	(7)	(7)	18.59
Other miscellaneous uses and specified uses not listed	49	306	6.24
Unspecified:[8]			
Reported	11,500	60,300	5.23
Estimated	10,500	56,300	5.35
Total or average	22,100	117,000	5.29
Grand total or average	35,600	207,000	5.82

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Includes pipe bedding.

[5]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[6]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[7]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[8]Reported and estimated production without a breakdown by end use.

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TABLE 3b

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	74	$398	$5.38
Riprap and jetty stone	102	1,080	10.58
Filter stone	43	273	6.35
Other coarse aggregates	140	695	4.96
Total or average	359	2,450	6.81
Coarse aggregate, graded:			
Concrete aggregate, coarse	694	6,050	8.72
Bituminous aggregate, coarse	166	1,180	7.10
Bituminous surface-treatment aggregate	68	396	5.82
Other graded coarse aggregates	49	299	6.10
Total or average	977	7,930	8.11
Fine aggregate (-⅜ inch):			
Stone sand, concrete	130	1,270	9.73
Stone sand, bituminous mix or seal	149	1,190	7.99
Screening, undesignated	433	1,160	2.68
Other fine aggregates	71	431	6.07
Total or average	783	4,050	5.17
Coarse and fine aggregates:			
Graded road base or subbase	971	7,050	7.26
Unpaved road surfacing	2,110	13,600	6.47
Crusher run or fill or waste	66	285	4.32
Roofing granules	W	W	11.86
Other coarse and fine aggregates	1,280	8,310	6.50
Total or average	4,420	29,300	6.62
Agricultural:			
Limestone	446	2,260	5.07
Poultry grit and mineral food	(2)	(2)	6.17
Other agricultural uses	434	3,130	7.20
Total or average	880	5,390	6.12
Chemical and metallurgical:			
Lime manufacture	(3)	(3)	4.96
Flux stone	(3)	(3)	6.22
Glass manufacture	(3)	(3)	13.19
Special, asphalt fillers or extenders	(4)	(4)	19.22
Other miscellaneous uses and specified uses not listed	42	258	6.14
Unspecified:[5]			
Reported	16,100	91,500	5.67
Estimated	12,000	67,000	5.59
Total or average	28,200	159,000	5.63
Grand total or average	36,800	215,000	5.85

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[3]Included in "Grand total or average."

[4]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	--	--	W	W	W	W	W	W
Coarse aggregate, graded[3]	--	--	W	W	W	W	1,260	11,400
Fine aggregate (-⅜ inch)[4]	--	--	190	852	--	--	W	W
Coarse and fine aggregate[5]	--	--	W	W	W	W	2,770	17,100
Other construction materials	--	--	91	738	3	17	162	740
Agricultural[6]	--	--	W	W	W	W	289	1,770
Chemical and metallurgical[7]	--	--	--	--	--	--	874	5,870
Special[8]	--	--	--	--	--	--	(9)	(9)
Other miscellaneous uses	--	--	--	--	--	--	3	20
Unspecified:[10]								
Reported	1,060	5,710	1,970	10,600	4,800	25,900	1,830	8,040
Estimated	--	--	3,450	16,700	122	737	3,290	19,100
Total	1,060	5,710	8,570	45,200	5,600	31,100	11,200	68,900

Use	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	--	--	199	1,620	--	--
Coarse aggregate, graded[3]	--	--	313	2,950	20	176
Fine aggregate (-⅜ inch)[4]	--	--	W	W	119	554
Coarse and fine aggregates[5]	--	--	2,080	15,400	548	3,320
Other construction materials	--	--	33	206	--	--
Agricultural[6]	--	--	W	W	20	92
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses	--	--	46	287	--	--
Unspecified:[10]						
Reported	805	4,310	1,060	5,730	--	--
Estimated	2,880	14,900	778	4,890	--	--
Total	3,690	19,200	4,800	32,700	707	4,140

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes lime and glass manufacture and flux stone.

[8]Includes asphalt fillers or extenders.

[9]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	--	--	W	W	W	W	W	W
Coarse aggregate, graded[3]	--	--	378	2,520	W	W	W	W
Fine aggregate (-⅜ inch)[4]	--	--	W	W	--	--	W	W
Coarse and fine aggregate[5]	--	--	1,850	10,100	W	W	803	5,930
Agricultural[6]	--	--	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	--	--	--	--	W	W
Special[8]	--	--	--	--	--	--	(9)	(9)
Other miscellaneous uses	--	--	--	--	--	--	--	--
Unspecified:[10]								
Reported	1,140	6,190	1,830	11,700	5,370	29,200	5,060	28,300
Estimated	--	--	4,100	20,000	--	--	3,800	23,000
Total	1,140	6,190	8,960	47,800	6,020	33,300	11,300	68,500

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	--	--	W	W	--	--
Coarse aggregate, graded[3]	--	--	W	W	57	341
Fine aggregate (-⅜ inch)[4]	--	--	W	W	109	641
Coarse and fine aggregates[5]	--	--	W	W	627	3,690
Agricultural[6]	--	--	W	W	22	134
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses	--	--	42	258	--	--
Unspecified:[10]						
Reported	873	4,670	1,870	11,400	--	--
Estimated	2,600	14,000	1,500	10,000	--	--
Total	3,470	18,900	5,050	35,400	815	4,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes lime and glass manufacture and flux stone.

[8]Includes asphalt fillers or extenders.

[9]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,980	$9,590	$4.83
Plaster and gunite sands	99	419	4.22
Concrete products (blocks, bricks, pipe, decorative, etc.)	27	112	4.11
Asphaltic concrete aggregates and other bituminous mixtures	251	1,400	5.56
Road base and coverings	1,310	3,660	2.79
Road stabilization (lime)	81	143	1.76
Fill	477	1,710	3.58
Snow and ice control	34	145	4.30
Other miscellaneous uses[2]	108	820	7.62
Unspecified:[3]			
Reported	6,270	30,800	4.91
Estimated	2,800	12,000	4.35
Total or average	13,400	61,000	4.54

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,570	$10,900	$4.24
Plaster and gunite sands	93	680	7.31
Concrete products (blocks, bricks, pipe, decorative, etc.)	34	197	5.77
Asphaltic concrete aggregates and other bituminous mixtures	272	1,110	4.06
Road base and coverings[2]	1,900	4,870	2.56
Fill	502	1,600	3.18
Snow and ice control	51	178	3.51
Other miscellaneous uses	32	509	16.16
Unspecified:[3]			
Reported	7,480	35,100	4.70
Estimated	4,200	19,000	4.54
Total or average	17,100	74,300	4.33

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (lime).
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a

IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	287	1,640	395	1,950	187	1,030
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	24	91	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	--	--	148	855	W	W
Road base and coverings[4]	712	1,840	488	1,210	112	438
Fill	31	118	92	359	66	196
Snow and ice control	14	49	16	77	3	20
Other miscellaneous uses[5]	5	28	121	822	91	331
Unspecified:[6]						
Reported	1,090	6,080	205	1,050	4,520	21,700
Estimated	1,100	4,700	500	2,700	700	2,700
Total	3,310	14,600	1,960	9,040	5,680	26,400

Use	District 4		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	621	2,570	494	2,410	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	29	158	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	--	--
Road base and coverings[4]	W	W	W	W	61	254
Fill	95	251	192	783	--	--
Snow and ice control	--	--	--	--	--	--
Other miscellaneous uses[5]	9	70	80	464	--	--
Unspecified:[6]						
Reported	247	938	203	995	--	--
Estimated	120	520	340	1,500	--	--
Total	1,120	4,500	1,310	6,190	61	254

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 3 and 5 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (lime).

[5]Includes railroad ballast.

[6]Reported and estimated production without a breakdown by end use.

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TABLE 6b

IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Districts 3 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	621	2,630	466	2,370	172	1,010
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	22	150	46	214	7	27
Asphaltic concrete aggregates and other bituminous mixtures	W	W	151	646	64	148
Road base and coverings[4]	855	2,070	778	1,820	163	561
Fill	115	387	70	290	147	510
Snow and ice control	W	W	15	56	W	W
Other miscellaneous uses	76	353	21	246	52	208
Unspecified:[5]						
Reported	1,950	10,000	243	1,210	4,710	21,600
Estimated	2,200	9,400	400	2,100	780	3,200
Total	5,790	25,100	2,190	8,990	6,090	27,300

Use	District 4		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	916	3,060	395	1,850	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	52	486	--	--	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--	--	--
Road base and coverings[4]	W	W	W	W	58	238
Fill	89	212	81	198	--	--
Snow and ice control	W	W	--	--	--	--
Other miscellaneous uses	24	297	3	18	--	--
Unspecified:[5]						
Reported	234	789	345	1,450	--	--
Estimated	210	920	670	3,400	--	--
Total	1,520	5,760	1,490	6,940	58	238

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 3 and 5 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (lime).

[5]Reported and estimated production without a breakdown by end use.

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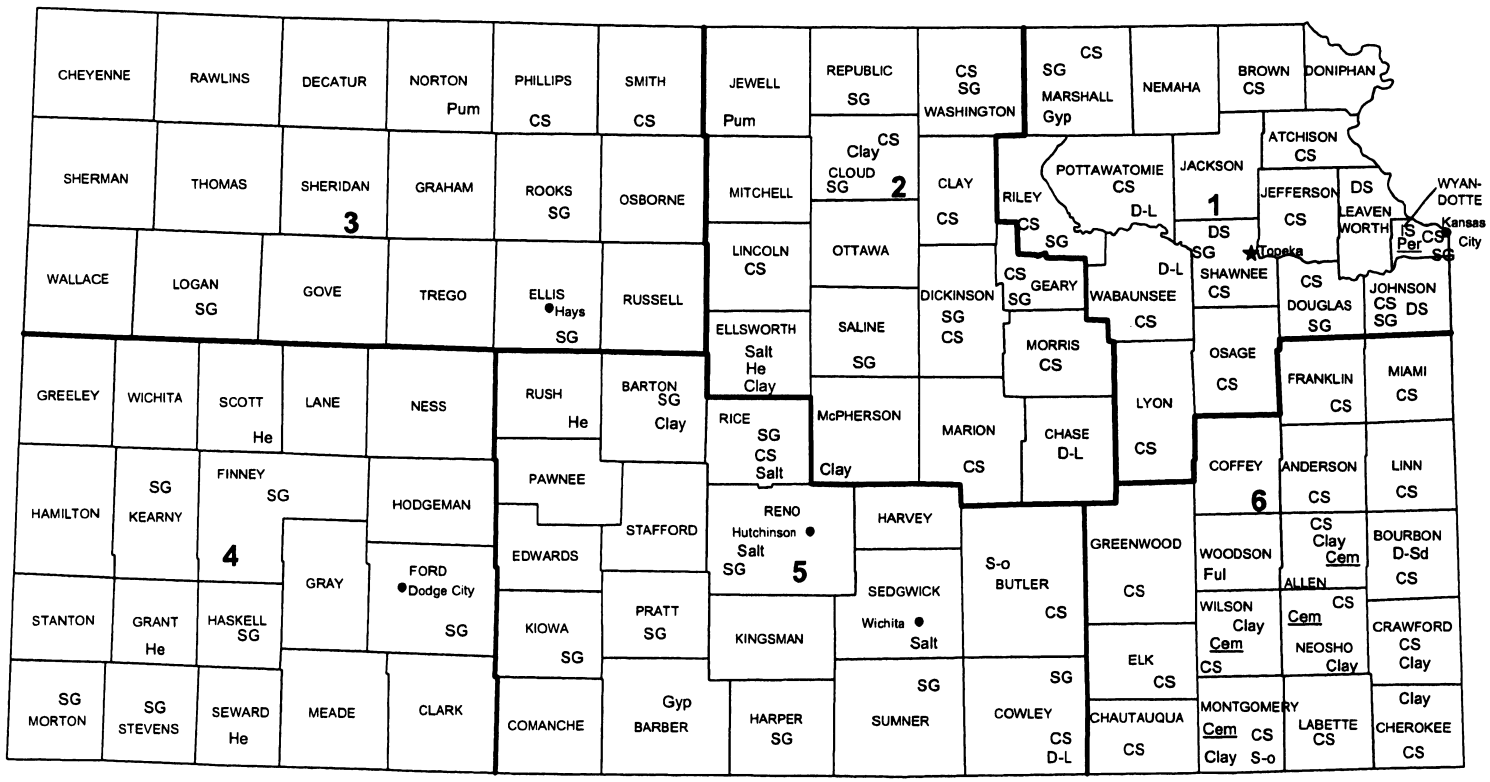
KANSAS



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
DS	Dimension stone
Ful	Fuller's earth
Gyp	Gypsum
He	Helium
IS	Industrial sand
Per	Perlite plant
Pum	Pumice and pumicite
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel

0 50 Kilometers

Source: Kansas Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF KANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kansas Geological Survey for collecting information on all nonfuel minerals.

In 2004, Kansas' nonfuel raw mineral production was valued[1] at $754 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of 8.3% from that of 2003[2] and followed a 1.3% increase from 2002 to 2003. The State was 23d in rank (21st in 2003) among the 50 States in total nonfuel mineral production value, of which Kansas accounted for nearly 1.7% of the U.S. total.

Portland cement, Grade-A helium, salt, and crushed stone were Kansas' leading nonfuel mineral commodities in 2004, accounting for about 28%, 25%, 17%, and 14%, respectively, and collectively about 84% of the State's total nonfuel mineral production value. In 2004, increases in the production and values of cement (portland and masonry), Grade-A helium, and crude helium, the values of which were up by about $40 million, $10 million, and $8 million, respectively, led the State's rise in nonfuel mineral production value for the year. Other smaller yet sizable value increases came from salt, up $4 million, and gypsum, up about $2 million. The largest decreases came from those of common clays, down by $2.5 million, and construction sand and gravel and crushed stone, down about $2 million each (table 1).

In 2003, the largest increases in nonfuel mineral value were those of construction sand and gravel and common clays, up by about $6 million each, crushed stone, up $5 million, and salt, up $4 million. Offsetting these somewhat were decreases that occurred in the values of portland cement, down about $7 million, and Grade-A helium, down about $2 million (table 1).

In 2004, Kansas continued to be the Nation's leading producer of Grade-A helium and crude helium (first of 2 producing States); it also remained 5th in the production of salt, and 8th in gypsum. Additionally, significant quantities of portland cement, crushed stone, and common clays, (descending order of value) were produced in the State. Production of nonfuel minerals in Kansas has consisted entirely of industrial minerals since 1970, following nearly a century (since 1877) of metallic mineral mining in the State. The last zinc and lead mining operation closed in 1970 owing in part to low zinc prices, low-grade ore, and the high operating costs of required pollution control systems.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The following narrative information was provided by the Kansas Geological Survey[3] (KGS).

Employment

Data from the Labor Management Information Services of the Kansas Department of Labor reported that the annual average employment in all aspects of mining during 2004 was 7,041 people. This represents an 8% increase from the average employment reported in 2003. The oil and gas industry employees were the majority, with the remainder employed in the coal and nonmetallic, nonfuel mining operations. The nonfuel industrial-mineral operations employed approximately 1,093 people, with an average salary of $40,092. This represents a 5.8% decrease in the number of employees and a 1.3% increase in average salary reported compared with respective values in 2003.

Mine Reclamation

The Kansas Governor's Mined Land Reclamation Award for 2004 went to Fogle South Quarry in Ottawa and Central Sand Company in Wichita. The Fogle South Quarry also received the national Noncoal Mine Reclamation Award from the National Association of State Land Reclamationists.

Legislation and Government Programs

The Kansas legislature in 2004 passed a Senate bill 364, which charged the chief engineer of Division of Water Resources and the Kansas Geological Survey to study and develop recommendations regarding 1) the use of water banking as it pertains to sand and gravel pits, 2) calculation of evapotranspiration and its effects on consumptive use from sand and gravel pits, and 3) the pollution control and flood control impacts of diverting water runoff into sand and gravel pits. They are to report to the House Environment Committee and Senate Natural Resources Committee by January 20, 2006 (Rex Buchanan, Associate Director for Public Outreach, Kansas Geological Survey, written commun., August 22, 2005).

The Kansas Supreme Court upheld a State law passed in 2001 banning local governments from selling aggregate to the public (U.S. Geological Survey, 2003). A Bourbon County, Kansas, judge had ruled that the city could sell a limited amount of aggregate for small jobs in Fort Scott because aggregate for small jobs is not readily available.

The 2004 Kansas Field Conference led by the Kansas Geological Survey took State legislators to a coalbed methane exploration site and the Bayer Stone Quarry (both are in Chase

[3]Gregory C. Ohlmacher, an Associate Scientist with the Kansas Geological Survey, authored the text of the State mineral industry information provided by that agency.

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County). The coalbed methane exploration site was one of two that were drilled by Penn Virginia Oil and Gas out of Kingsport, TN. The target coalbed was 600 meters deeper and thicker than coals used in the established fields in southeastern Kansas. Bayer Stone, Inc. quarries and finishes limestone for the outside of commercial and residential buildings, as well as countertops, floor tiles, windowsills, and other uses inside homes and buildings. The field conference guidebook is available from the Kansas Geological Survey (Sawin and others, 2004).

Interest in developing coalbed methane remained high in Kansas. Approximately 380 million cubic meters of coalbed methane was produced in 2004.

Geologic mapping continued with Federal matching funding from the STATEMAP program, a component of the USGS National Cooperative Mapping Program. One county geologic map was completed during 2004: a digital upgrade map of Pottawatomie County (KGS M-110). Geologic field mapping continued during the year in Cheyenne, Crawford, Edwards, Geary, Morton, Pawnee, Republic, Saline, Sedgwick, and Washington Counties. Digital efforts and reviews of maps continued for Barber, Clark, Cheyenne, Crawford, Ford, Gray, Hodgeman, Neosho, Osborne, and Wabaunsee Counties.

A total of 66 open-file reports (OFR) were filed with the library at the Kansas Geological Survey. Preliminary geologic maps of Crawford County and the Tallgrass Prairie National Preserve were released along with reports on coalbed methane, energy resources, geophysical studies, ground water studies, and other geologic studies.

References Cited

Sawin, R.S., Buchanan, R.C., and McCauley, J.R., 2004, The Kansas Flint Hills Energy, Prairie, and Preservation: Kansas Geological Survey Open-File Report 2004-22.

U.S. Geological Survey, 2003, The mineral industry of Kansas, *in* Area reports—Domestic: U.S. Geological Survey Minerals Yearbook 2001, v. II, p. 18.1-18.5.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KANSAS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Cement, portland		2,350	181,000 e	2,270	173,000 e	2,690	212,000 e
Clays, common		642	4,280	632	10,000	621	7,460
Gemstones		NA	1	NA	1	NA	1
Helium, Grade-A	million cubic meters	78	181,000	77	179,000	82	189,000
Salt		2,630	119,000	2,770	123,000	2,890	127,000
Sand and gravel, construction		9,560	28,700	10,700	34,900	9,930	32,800
Stone:							
Crushed		21,300 r	106,000 r	20,700	111,000	19,800	109,000
Dimension		15	1,900	15	1,640	14	1,730
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial)		XX	64,800	XX	65,100	XX	75,300
Total		XX	687,000 r	XX	696,000	XX	754,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
KANSAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	99	W	W	$5.00	111	W	W	$5.39	106	W	W	$5.53
Quartzite	2	W	W	4.06	2	W	W	4.22	2	W	W	4.09
Total or average	XX	21,300 r	$106,000 r	4.98 r	XX	20,700	$111,000	5.36	XX	19,800	$109,000	5.49

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	82	$946	$11.54
Filter stone	W	W	8.84
Other coarse aggregates	207	1,790	8.65
Total or average	289	2,740	9.47
Coarse aggregate, graded:			
Concrete aggregate, coarse	188	1,540	8.19
Bituminous aggregate, coarse	(2)	(2)	6.61
Bituminous surface-treatment aggregate	(2)	(2)	5.79
Other graded coarse aggregates	1,460	9,930	6.82
Total or average	1,650	11,500	6.97
Fine aggregate (-¾ inch):			
Screening, undesignated	423	1,500	3.54
Other fine aggregates	154	1,170	7.62
Total or average	577	2,670	4.63
Coarse and fine aggregates:			
Graded road base or subbase	249	1,180	4.73
Unpaved road surfacing	727	3,640	5.00
Crusher run or fill or waste	(3)	(3)	8.53
Other coarse and fine aggregates	814	5,620	6.90
Total or average	1,790	10,400	5.83
Agricultural limestone	(4)	(4)	6.42
Chemical and metallurgical, cement manufacture	(4)	(4)	5.15
Other miscellaneous uses and specified uses not listed	1,300	7,000	5.39
Unspecified:[5]			
Reported	9,960	49,700	4.99
Estimated	2,100	11,000	5.37
Total or average	12,000	60,800	5.06
Grand total or average	20,700	111,000	5.36

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 3b

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$4.96
Riprap and jetty stone	128	$1,290	10.05
Filter stone	W	W	8.67
Total or average	265	2,300	8.69
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	6.39
Bituminous aggregate, coarse	451	3,720	8.25
Bituminous surface-treatment aggregate	W	W	2.76
Total or average	476	3,850	8.08
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(2)	(2)	4.96
Screening, undesignated	295	1,240	4.20
Coarse and fine aggregates:			
Graded road base or subbase	379	1,870	4.93
Unpaved road surfacing	548	2,540	4.63
Crusher run or fill or waste	(3)	(3)	8.45
Other coarse and fine aggregates	568	4,080	7.18
Total or average	1,500	8,490	5.68
Agricultural limestone	24	114	4.75
Chemical and metallurgical, cement manufacture	1,910	12,000	6.30
Unspecified:[4]			
Reported	12,600	65,200	5.18
Estimated	2,800	15,000	5.62
Total or average	15,300	80,700	5.26
Grand total or average	19,800	109,000	5.49

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	--	--
Coarse aggregate, graded[4]	990	7,170	--	--	--	--
Fine aggregate (-⅜ inch)[5]	W	W	W	W	--	--
Coarse and fine aggregate[6]	519	3,250	W	W	126	594
Agricultural[7]	W	W	--	--	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--
Other miscellaneous use	1,300	7,000	--	--	--	--
Unspecified:[9]						
Reported	3,850	19,300	1,510	7,180	--	--
Estimated	380	2,000	570	3,000	80	410
Total	7,710	43,100	2,220	10,900	203	1,010

Use	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	6	48
Coarse aggregate, graded[4]	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W
Coarse and fine aggregate[6]	W	W	727	3,580
Agricultural[7]	W	W	W	W
Chemical and metallurgical[8]	--	--	W	W
Other miscellaneous use	--	--	--	--
Unspecified:[9]				
Reported	541	2,760	4,070	20,500
Estimated	--	--	1,000	5,600
Total	1,150	7,330	9,400	48,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone was produced in District 4.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded coarse aggregates.

[5]Includes screening (undesignated) and other fine aggregates.

[6]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone.

[8]Includes cement manufacture.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	--	--
Coarse aggregate, graded[4]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[5]	W	W	W	W	--	--
Coarse and fine aggregate[6]	W	W	W	W	W	W
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--
Unspecified:[9]						
Reported	4,280	22,700	1,550	7,350	--	--
Estimated	1,200	7,000	570	3,000	24	130
Total	6,400	35,600	2,210	11,000	137	665

Use	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	W	W
Coarse aggregate, graded[4]	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W
Coarse and fine aggregate[6]	W	W	W	W
Agricultural[7]	W	W	--	--
Chemical and metallurgical[8]	--	--	1,910	12,000
Unspecified:[9]				
Reported	542	2,770	6,180	32,300
Estimated	--	--	990	5,300
Total	1,090	6,840	9,950	54,500

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone was produced in District 4.

[3]Includes filter stone, macadam, and riprap and jetty stone.

[4]Includes concrete aggregate (coarse), bituminous aggregate (coarse), and bituminous surface-treatment aggregate.

[5]Includes screening (undesignated) and stone sand (bituminous mix or seal).

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone.

[8]Includes cement manufacture.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,470	$7,580	$3.07
Plaster and gunite sands	76	221	2.89
Concrete products (blocks, bricks, pipe, decorative, etc.)	30	114	3.83
Asphaltic concrete aggregates and other bituminous mixtures	935	3,190	3.41
Road base and coverings	1,880	5,390	2.87
Road and other stabilization (cement and lime)	231	489	2.12
Fill	1,250	2,870	2.30
Snow and ice control	150	594	3.97
Railroad ballast	33	276	8.48
Other miscellaneous uses	229	641	2.80
Unspecified:[2]			
Reported	688	3,900	5.67
Estimated	2,700	9,600	3.53
Total or average	10,700	34,900	3.26

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 5b
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,380	$4,710	$3.41
Plaster and gunite sands	20	60	3.05
Concrete products (blocks, bricks, pipe, decorative, etc.)	3	27	10.10
Asphaltic concrete aggregates and other bituminous mixtures	589	3,000	5.09
Road base and coverings[2]	1,480	4,460	3.01
Fill	802	1,640	2.04
Snow and ice control	66	245	3.73
Other miscellaneous uses	13	166	12.38
Unspecified:[3]			
Reported	1,840	5,710	3.10
Estimated	3,700	13,000	3.43
Total or average	9,930	32,800	3.31

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a

KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	737	2,570	190	832	77	238
Plaster and gunite sands	W	W	W	W	3	14
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	--	--	--	--
Asphaltic concrete aggregates and other bituminous mixtures	187	759	W	W	W	W
Road base and coverings[2]	42	176	217	833	363	770
Fill	134	522	194	530	21	59
Snow and ice control	16	57	21	86	4	11
Other miscellaneous uses[3]	13	71	69	329	8	18
Unspecified:[4]						
Reported	7	37	5	11	--	--
Estimated	960	3,000	150	480	35	120
Total	2,100	7,190	846	3,100	511	1,230

	District 4		District 5		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	229	668	1,230	3,250	9	26
Plaster and gunite sands	17	58	W	W	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	20	52	--	--
Asphaltic concrete aggregates and other bituminous mixtures	65	182	537	1,720	69	211
Road base and coverings[2]	880	2,240	560	1,770	12	31
Fill	116	299	785	1,460	(5)	(5)
Snow and ice control	75	240	32	193	2	7
Other miscellaneous uses[3]	4	21	303	980	--	--
Unspecified:[4]						
Reported	140	2,200	537	1,660	--	--
Estimated	650	3,200	940	2,900	--	--
Total	2,180	9,090	4,940	13,900	92	275

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road and other stabilization (cement and lime).

[3]Includes railroad ballast.

[4]Reported and estimated production without a breakdown by end use.

[5]Less than ½ unit.

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TABLE 6b

KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	686	2,690	113	372	64	169
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	3	11	W	W
Asphaltic concrete aggregates and other bituminous mixtures	330	1,790	W	W	W	W
Road base and coverings[4]	106	815	418	921	365	933
Fill	233	655	21	49	46	108
Snow and ice control	W	W	15	56	W	W
Other miscellaneous uses	38	208	52	235	61	233
Unspecified:[5]						
Reported	2	12	--	--	--	--
Estimated	880	2,900	740	2,800	900	3,600
Total	2,280	9,090	1,360	4,430	1,440	5,030

	District 5		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	517	1,480	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	11	48	--	--
Asphaltic concrete aggregates and other bituminous mixtures	100	656	59	192
Road base and coverings[4]	582	1,760	11	29
Fill	501	825	--	--
Snow and ice control	18	55	3	11
Other miscellaneous uses	(6)	1	--	--
Unspecified:[5]				
Reported	1,840	5,690	--	--
Estimated	1,200	3,500	--	--
Total	4,770	14,000	73	232

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 2 and 3 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement and lime).

[5]Reported and estimated production without a breakdown by end use.

[6]Less than ½ unit.

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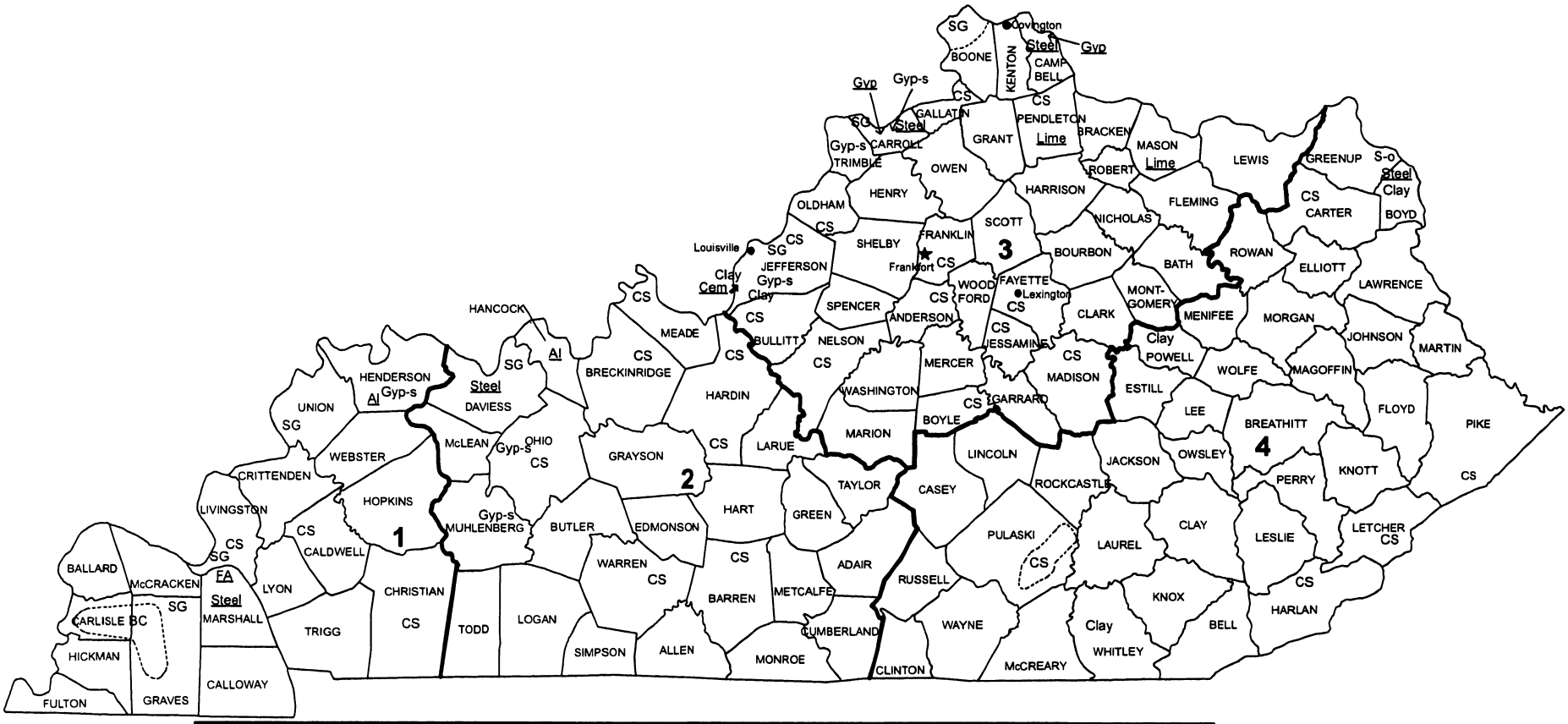
KENTUCKY



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOL (Major producing areas)

AI	Aluminum plant
BC	Ball clay
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
FA	Ferroalloys plant
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
Lime	Lime plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
⬭	Concentration of mineral operations

0 — 50 Kilometers

Source: Kentucky Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF KENTUCKY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kentucky Geological Survey for collecting information on all nonfuel minerals.

In 2004, Kentucky's nonfuel raw mineral production was valued[1] at $648 million, an 8.5% increase from that of 2003, based upon annual U.S. Geological Survey (USGS) data. This followed a 10.1% increase in 2003[2] from that of 2002, based upon annual data. Kentucky was 25th in rank (24th in 2003) among the 50 States in total nonfuel mineral production value, accounting for nearly 1.5% of the U.S. total.

Crushed stone continued to be Kentucky's leading nonfuel mineral commodity in 2004 and accounted for about 54% of the State's raw nonfuel mineral production value. Lime was second, followed by cement (portland and masonry) and construction sand and gravel. These four mineral commodities accounted for about 98% of the State's total nonfuel mineral value. In 2004, there were increases in the production and values of lime, value up more than $25 million, crushed stone, up $21 million, and cement and construction sand and gravel, up more than $3 million each. The only decrease in value was for ball clay, down about $4 million.

In 2003, the production and values increased for crushed stone, value up $24 million, lime, up about $16 million, construction sand and gravel, up nearly $9 million, portland cement, up about $5 million, and ball clays, up nearly $3 million (table 1). Although small relative to these, decreases took place in the values of masonry cement, common clays, and gemstones (descending order of change).

In 2004, Kentucky rose to 2d from 3d in the quantity of lime that was produced in the State, dropped to 4th from 3d of the four ball-clay-producing States, and dropped to 11th from 9th in common clays. Additionally, the State produced significant quantities of crushed stone, portland cement, and construction sand and gravel (descending order of value). Primary aluminum and raw steel were produced from materials obtained from other domestic and foreign sources. Kentucky remained the Nation's leading producer of primary aluminum.

Based upon 2004 USGS annual nonfuel mineral production data, Kentucky ranked 19th in the Nation in its minerals industry's value of nonfuel mineral production per capita; having a population of nearly 4.2 million, the State's per capita value of nonfuel mineral production was $155. The following narrative information was provided by the Kentucky Geological Survey[3] (KGS).

Exploration and Development Activities

In 2003, diamond exploration took place in the Western Kentucky Fluorspar District when Marum Resources Inc. (2003§[4]) purchased an option from Resource Finance and Investment Limited to conduct a 4-year exploration program around the Coefield Magnetic Anomaly (also called the Lollipop) in Crittenden County. The area near Coefield Creek in Crittenden County is a host for a large ultramafic intrusive complex that had been poorly explored, and Marum planned to conduct coring, petrographic, and caustic dissolution analysis to look for diamonds. Many of these dikes are considered lamprophyres, although some have been reported to be kimberlite dikes. Marum sampled what they determined to be kimberlite dikes and conducted analysis for diamonds, but reported that no diamonds were found. Zinc and fluorite mineral exploration has also been conducted in the area, and zinc mineralization may be related to dike formation, but there has been no mining activity. Currently, KGS is conducting a research program in the area to study the complex ultramafic bodies and their relationship to mineralization.

Many operations in the State were expanding laterally as their reserves diminished, forcing many operators into legal action as opposition to expansion continued. Some quarries began to mine underground to increase reserves. Other operations looked at adding other products to their operations such as blacktop or lime plants.

Commodity Review

Industrial Minerals

Crushed Stone.—The Vulcan Materials Co.'s Grand Rivers Quarry in Livingston County was the State's leading producing quarry. Based upon 2004 USGS annual production data, the Grand Rivers Quarry ranked as the seventh largest quarry in order of output of crushed stone in the United States. The central Kentucky region (crushed stone/sand and gravel district 3) continued to lead the State in total aggregate value and production because of the increasing demand in urban and industrial markets.

The Rogers Group Inc. acquired the Rock Springs Quarry in Oldham County from Liter's Quarry during the year as a

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Warren H. Anderson, Geologist and Principal Investigator with the Kentucky Geological Survey, submitted the text of the State mineral industry information provided by that agency.

[4]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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part of their regional expansion (Markley, 2004). The Rock Springs Quarry had just won a legal battle that allowed them to expand operations near the city of Louisville by virtue of their conditional use permit.

Legislation and Government Programs

Transportation and weight limits for natural resource haulers became the biggest issue during 2004. The Kentucky Legislature submitted a bill to increase weight limits for aggregate and sand trucks on State roads. The bill followed the outgrowth of a lawsuit in an eastern Kentucky court that challenged the current weight limit imposed on natural resource haulers because it differed from the limit of coal haulers. The current weight limit for hauling sand, gravel, and aggregate is 36 metric tons (t). Some road builders and truckers have lobbied to allow minerals other than coal to be transported at the same weight limits as coal, or 54 t, with an extended weight permit. Many city and county leaders, environmentalists, and truckers opposed the bill. In March 2005, a modified version of the bill passed the State Senate, but failed in the House.

In 2004, Kentucky reached a milestone in digital geologic mapping history when all 707 geologic quadrangles maps (7.5-minute, 1:24,000-scale) were completely digitized (from 1996 to 2004). During 2005, KGS is compiling these maps into a set of 30 x 60-minute, 1:100,000-scale maps for public distribution. KGS has begun to release these maps via the KGSGeoPortal, an Internet map server. This Web site allows a user to download various types of geologic data to create custom maps at URL http://kgsmap.uky.edu/website/KGSGeoPortal/KGSGeoPortal.asp.

Reference Cited

Markley, Rick, 2004, Rogers Group buys four quarries: Rock Products, May 1, p. 5.

Internet Reference Cited

Marum Resources Inc., 2003, Press Release, accessed August 28, 2005, at URL http://www.marumresources.com/ id42_m.htm.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KENTUCKY[1, 2]

(Thousand metric tons and thousand dollars)

	2002		2003		2004	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	925	4,740	983	3,770	978	4,510
Gemstones	NA	64	NA	22	NA	22
Sand and gravel, construction	9,530	37,900	10,000	46,500	10,300	49,700
Stone, crushed	50,600	302,000	52,400	326,000	55,600	347,000
Combined values of cement, clays (ball), lime	XX	197,000	XX	220,000	XX	246,000
Total	XX	542,000	XX	597,000	XX	648,000

NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
KENTUCKY: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2002				2003				2004			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	90	W	W	$5.99	94	W	W	$6.20	87	W	W	$6.23
Dolomite	1	W	W	5.24	1	W	W	7.35	1	W	W	6.80
Total or average	XX	50,600	$302,000	5.97	XX	52,400	$326,000	6.22	XX	55,600	$347,000	6.24

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	183	$1,300	$7.08
Filter stone	235	1,510	6.43
Other coarse aggregates	1,670	10,000	5.99
Total or average	2,090	12,800	6.13
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,900	13,100	6.88
Bituminous aggregate, coarse	2,680	20,400	7.58
Bituminous surface-treatment aggregate	683	5,010	7.33
Railroad ballast	W	W	7.28
Other graded coarse aggregates	6,450	47,100	7.31
Total or average	11,700	85,600	7.30
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	8.47
Stone sand, bituminous mix or seal	406	2,950	7.26
Screening, undesignated	1,250	5,030	4.02
Other fine aggregates	1,810	12,200	6.75
Total or average	3,470	20,200	5.82
Coarse and fine aggregates:			
Graded road base or subbase	3,540	26,800	7.56
Unpaved road surfacing	562	3,620	6.44
Crusher run or fill or waste	534	3,470	6.49
Other coarse and fine aggregates	2,350	15,900	6.77
Total or average	6,980	49,700	7.12
Agriculture limestone	726	4,080	5.62
Chemical and metallurgical, lime manufacture	(3)	(3)	8.78
Special, asphalt fillers or extenders	(3)	(3)	7.28
Unspecified:[4]			
Reported	15,900	79,800	5.02
Estimated	7,300	37,000	5.03
Total or average	23,200	117,000	5.02
Grand total or average	52,400	326,000	6.22

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b

KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.28
Riprap and jetty stone	218	$1,910	8.75
Filter stone	172	1,110	6.42
Other coarse aggregates	1,560	9,960	6.39
Total or average	1,950	13,000	6.66
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,740	12,500	7.20
Bituminous aggregate, coarse	2,940	23,200	7.87
Bituminous surface-treatment aggregate	692	4,950	7.15
Other graded coarse aggregates	5,580	40,800	7.30
Total or average	11,000	81,400	7.43
Fine aggregate (-¾ inch):			
Stone sand, concrete	(2)	(2)	8.21
Stone sand, bituminous mix or seal	897	8,770	9.77
Screening, undesignated	359	2,310	6.43
Other fine aggregates	2,050	13,300	6.48
Total or average	3,310	24,400	7.37
Coarse and fine aggregates:			
Graded road base or subbase	3,730	26,600	7.13
Unpaved road surfacing	97	642	6.62
Crusher run or fill or waste	329	2,320	7.04
Other coarse and fine aggregates	5,310	36,900	6.96
Total or average	9,460	66,500	7.02
Agriculture limestone	397	2,050	5.17
Unspecified:[3]			
Reported	16,500	82,400	4.98
Estimated	13,000	78,000	5.96
Total or average	29,600	160,000	5.41
Grand total or average	55,600	347,000	6.24

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	236	1,590
Coarse aggregate, graded[3]	W	W	2,330	15,900	5,860	44,300	W	W
Fine aggregate (-¾ inch)[4]	W	W	W	W	1,580	7,700	284	2,090
Coarse and fine aggregate[5]	W	W	1,080	6,920	4,110	29,100	W	W
Agricultural[6]	12	164	W	W	W	W	44	231
Chemical and metallurgical[7]	--	--	--	--	W	W	--	--
Special[8]	--	--	W	W	--	--	--	--
Unspecified:[9]								
Reported	3,720	20,400	2,670	10,400	2,450	11,700	7,060	37,300
Estimated	67	350	2,100	11,000	2,500	13,000	2,600	13,000
Total	10,100	63,000	9,600	53,400	21,400	146,000	11,400	63,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes lime manufacture.

[8]Includes asphalt fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 4b

KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	770	5,110	W	W
Coarse aggregate, graded[3]	W	W	2,880	21,000	4,770	36,400	W	W
Fine aggregate (-¾ inch)[4]	W	W	1,360	12,200	800	5,420	W	W
Coarse and fine aggregate[5]	W	W	W	W	7,050	49,800	W	W
Agricultural[6]	W	W	W	W	131	763	W	W
Unspecified:[7]								
Reported	5,940	32,200	2,760	10,700	2,510	12,000	5,330	27,500
Estimated	120	600	2,300	12,000	7,400	43,000	3,200	22,000
Total	12,000	73,800	10,600	65,000	23,400	152,000	9,630	56,300

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Reported and estimated production without a breakdown by end use.

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TABLE 5a
KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1, 2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,240	$31,900	$5.11
Asphaltic concrete aggregates and road base materials[3]	305	884	2.90
Unspecified:[4]			
Reported	721	2,950	4.10
Estimated	2,600	10,000	3.88
Total or average	10,000	46,500	4.64

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]To avoid disclosing company proprietary data, no district tables were produced for 2003.
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Includes fill.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1, 2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,310	$33,300	$5.27
Asphaltic concrete aggregates and road base materials	108	652	6.06
Fill	272	1,010	3.71
Unspecified:[3]			
Reported	1,320	5,250	3.98
Estimated	2,300	9,500	4.14
Total or average	10,300	49,700	4.82

[1]To avoid disclosing company proprietary data, no district tables were produced for 2004.
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Reported and estimated production without a breakdown by end use.

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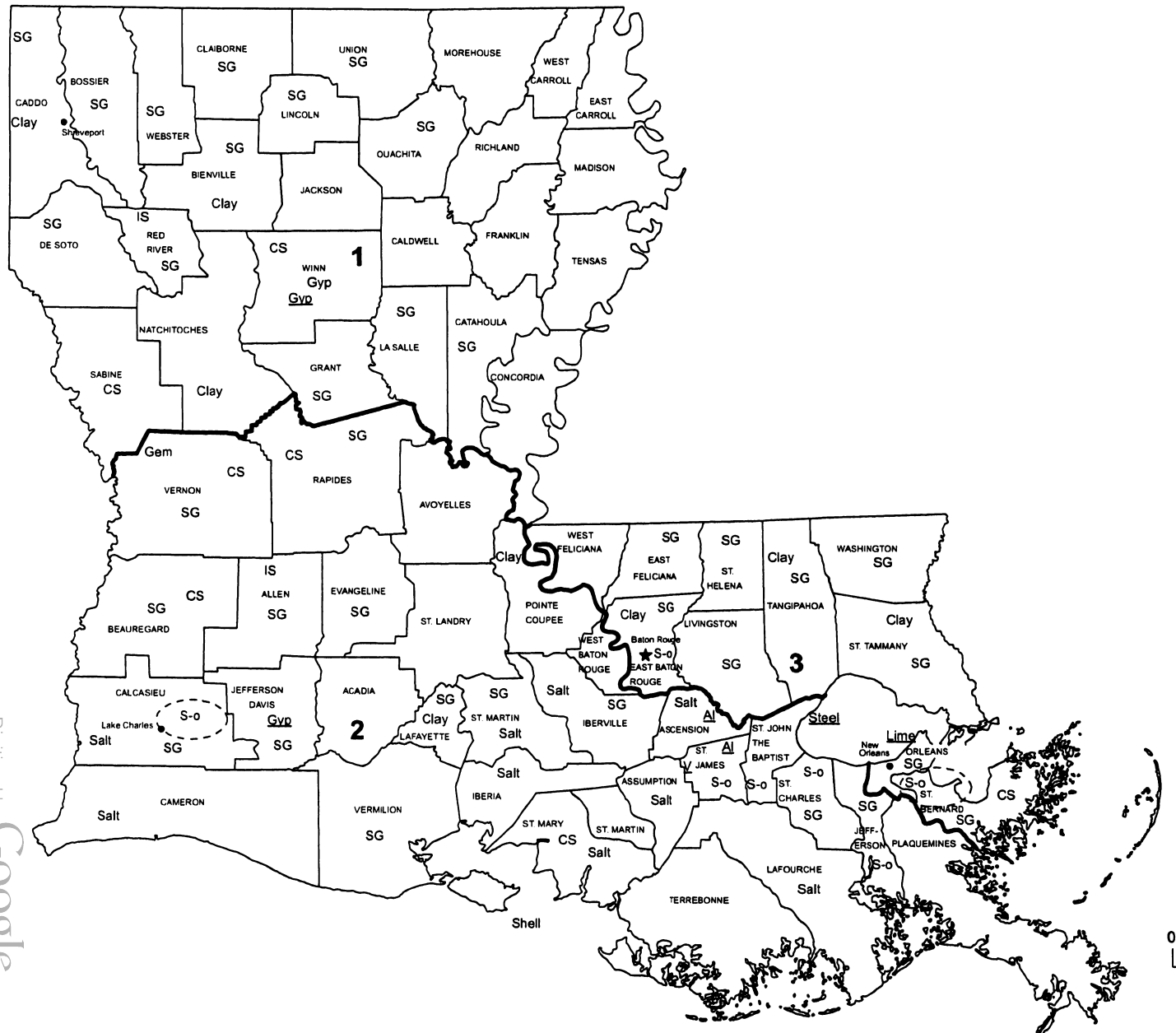

LEGEND

- Parish boundary
- ★ Capital
- • City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Clay	Common clay
CS	Crushed stone
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Shell	Shell
Steel	Steel plant
V	Vanadium plant
	Concentration of mineral operations

0 50 Kilometers

Source: Louisiana Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF LOUISIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Louisiana Geological Survey for collecting information on all nonfuel minerals.

In 2004, Louisiana's nonfuel raw mineral production[1] was valued at $356 million, based upon annual U.S. Geological Survey (USGS) data. This was a 3% decrease compared with that of 2003,[2] which was up 17.6% from 2002. The State was 36th in rank (34th in 2003) among the 50 States in total nonfuel mineral production value, and Louisiana accounted for about 1% of the U.S. total.

Louisiana's leading nonfuel raw mineral, based on value, continued to be salt, accounting for about 52% of the State's nonfuel mineral value in 2004. This was followed by construction sand and gravel, making up about 29% of the State's value, crushed stone (company proprietary data), industrial sand and gravel, representing about 4% of the same value, and lime.

In 2004, a 14% increase in the production of salt was accompanied by a more than 22%, or a $34 million increase in the commodity's value. But decreases in the values of most of the State's other nonfuel minerals, the largest of which were those of crushed stone (down more than $30 million) and lime, resulted in the State's drop in total value for the year (table 1). In 2004, Louisiana continued to lead the Nation in the quantity of salt produced, ahead of 14 other producing States. Additionally, the State was a significant producer of construction sand and gravel, industrial sand and gravel, and common clays (descending order of value).

In 2003, virtually all nonfuel minerals had increased production and value compared with that of 2002 (only industrial sand and gravel production was down slightly and gemstones value was unchanged). The increase in total value over that of 2002 largely resulted from increases in salt and crushed stone of $23 million and $18 million, respectively, as well as increases of more than $8 million in construction sand and gravel and more than $5 million in industrial sand and gravel (table 1).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN LOUISIANA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	667	1,680	670	1,690	399	1,000
Gemstones	NA	6	NA	6	NA	6
Salt	12,000	129,000	12,600	152,000	14,300	186,000
Sand and gravel:						
Construction	17,900	96,800	21,200	105,000	19,400	103,000
Industrial	541	12,000	499	17,200	476	14,800
Combined values of gypsum (crude), lime, stone (crushed limestone, sandstone, miscellaneous)	XX	72,400	XX	91,000	XX	51,200
Total	XX	312,000	XX	367,000	XX	356,000

NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

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TABLE 2
LOUISIANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2002				2003				2004			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	(2)	W	W	$10.85	(2)	W	W	$10.92	(2)	W	W	$11.50
Sandstone	(2)	W	W	11.23	(2)	W	W	11.02	(2)	W	W	11.02
Miscellaneous stone	(2)	W	W	11.02	(2)	W	W	11.02	--	--	--	--
Total or average	XX	W	W	11.06	XX	W	W	10.99	XX	W	W	11.25

W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.
[1]A significant amount of sold or used materials was shipped in from other States.
[2]Sales/distribution yards.

TABLE 3a
LOUISIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1, 2, 3]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), other coarse aggregates	W	W	$14.09
Other graded coarse aggregates	W	W	13.40
Fine aggregate (-⅜ inch), other fine aggregates	W	W	12.75
Other coarse and fine aggregates	W	W	11.53
Unspecified:[4]			
Reported	5,480	$57,900	10.57
Estimated	207	2,270	10.95
Total or average	W	W	10.99

W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits, except unit value.
[2]Most of the production included in this table was shipped into Louisiana from other States.
[3]To avoid disclosing company proprietary data, no district tables were produced for 2003.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b
LOUISIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1, 2, 3]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), other coarse aggregates	W	W	$20.06
Coarse aggregate, graded, other graded coarse aggregates	W	W	15.53
Fine aggregate (-⅜ inch), other fine aggregates	W	W	15.35
Coarse and fine aggregates, other coarse and fine aggregates	W	W	12.68
Unspecified:[4]			
Reported	2,090	$22,100	10.57
Estimated	1,100	11,000	10.68
Total or average	W	W	11.25

W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits, except unit value.
[2]Most of the production included in this table was shipped into Louisiana from other States.
[3]To avoid disclosing company proprietary data, no district tables were produced for 2004.
[4]Reported and estimated production without a breakdown by end use.

TABLE 4a
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1,2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[3]	5,820	$31,800	$5.48
Asphaltic concrete aggregates and other bituminous mixtures	552	2,790	5.05
Road base and coverings	1,160	12,500	10.81
Fill	634	2,640	4.16
Other miscellaneous uses[4]	1,970	5,190	2.63
Unspecified:[5]			
Reported	4,950	23,700	4.80
Estimated	6,200	27,000	4.30
Total or average	21,200	105,000	4.95

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]To avoid disclosing company proprietary data, no district tables were produced for 2003.
[3]Includes plaster and gunite sands.
[4]Includes railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

TABLE 4b
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,180	$45,800	$5.60
Asphaltic concrete aggregates and other bituminous mixtures	390	3,200	8.19
Road base and coverings	1,060	12,500	11.78
Fill	914	2,570	2.81
Other miscellaneous uses[2]	169	817	4.83
Unspecified:[3]			
Reported	1,930	10,500	5.43
Estimated	6,700	27,000	4.07
Total or average	19,400	103,000	5.31

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 5
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[3]	2,510	20,400	7,120	41,100	--	--
Fill	85	366	828	2,200	--	--
Other miscellaneous uses[4]	157	625	12	192	--	--
Unspecified:[5]						
Reported	1,790	9,470	134	994	--	--
Estimated	4,500	18,000	2,200	9,800	11	18
Total	9,050	48,400	10,300	54,200	11	18

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes asphaltic concrete aggregates and road base materials.
[4]Includes railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

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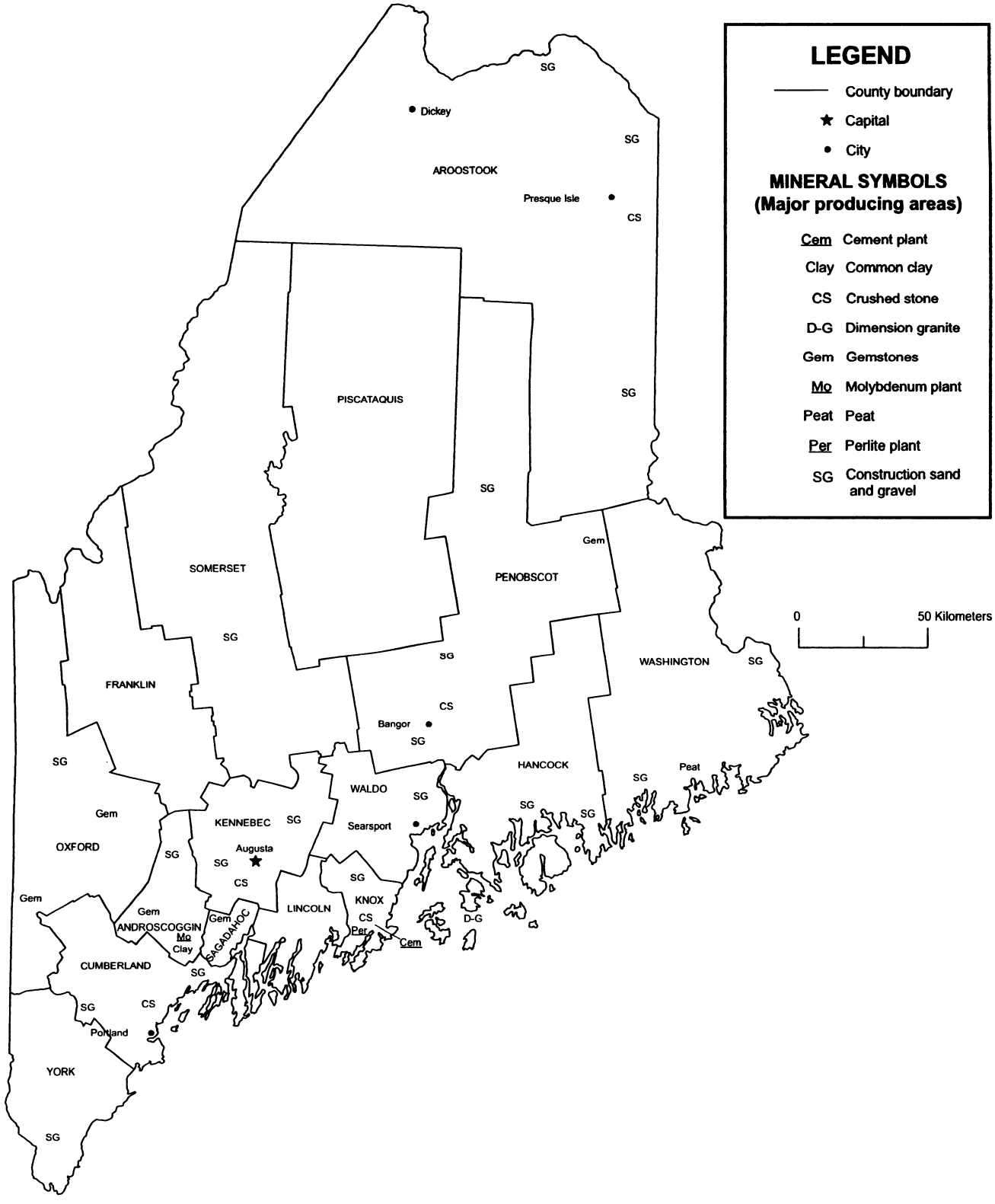
MAINE



Source: Maine Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MAINE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maine Geological Survey for collecting information on all nonfuel minerals.

In 2004, Maine's nonfuel raw mineral production was valued[1] at $118 million, based upon annual U.S. Geological Survey data. This was a 10.3% increase from that of 2003,[2] which was up 7.3% from 2002.

The large majority of Maine's nonfuel mineral production resulted from the mining and production of construction minerals and materials—construction sand and gravel, portland cement, crushed stone, and dimension granite (descending order of value). In 2004, construction sand and gravel and crushed stone accounted for nearly 67% of the State's total nonfuel raw mineral production value. Increases in the production of crushed stone, value up $7 million, portland cement, and construction sand and gravel, up $1.5 million (descending order of change) accounted for most of Maine's increase in total value for the year. The only significant decrease in commodity value took place in dimension granite.

In 2004, Maine was 12th (11th in 2003) in the production of gemstones (based upon value) and significant quantities of construction sand and gravel were produced in the State.

In 2003, the largest increases in value took place in construction sand and gravel and dimension granite, up more than $7 million and more than $1 million, respectively. The largest decrease was that of crushed stone, down slightly less than $1 million (table 1).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MAINE [1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	49 e	125 e	49 e	125 e	49	W
Gemstones	NA	257	NA	262	NA	268
Sand and gravel, construction	9,680	40,400	10,400	47,600	10,800	49,100
Stone, crushed	4,010	23,400	3,530	22,500	4,370	29,500
Combined values of cement, peat, stone (dimension granite), and values indicated by symbol W	XX	35,400	XX	36,700	XX	39,300
Total	XX	99,700	XX	107,000	XX	118,000

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MAINE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4	1,390	$7,550	$5.42	4	1,350	$7,600	$5.65	4	1,680	$10,300	$6.12
Granite	4	1,360	8,350	6.14	3	1,320	9,300	7.06	6	1,980	14,300	7.23
Traprock	1	W	W	6.61	--	--	--	--	--	--	--	--
Quartzite	2	W	W	6.14	2	W	W	6.29	2	W	W	6.90
Slate	1	W	W	9.89	1	W	W	10.21	1	W	W	10.79
Miscellaneous stone	2	710	4,040	5.68	2	273	1,730	6.36	2	209	1,340	6.40
Total or average	XX	4,010	23,400	5.85	XX	3,530	22,500	6.38	XX	4,370	29,500	6.75

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

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TABLE 3a

MAINE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	65	$391	$6.02
Filter stone	W	W	6.59
Other coarse aggregates	20	151	7.55
Total or average	85	542	6.38
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	4.96
Bituminous aggregate, coarse	(2)	(2)	7.59
Bituminous surface-treatment aggregate	(2)	(2)	13.11
Railroad ballast	(2)	(2)	7.46
Total or average	506	3,620	7.16
Fine aggregate (-⅜ inch):			
Stone sand, concrete	114	635	5.57
Stone sand, bituminous mix or seal	(3)	(3)	8.82
Screening, undesignated	(3)	(3)	2.76
Other fine aggregates	56	345	6.16
Total or average	170	980	5.76
Coarse and fine aggregates, other coarse and fine aggregates	1,180	8,030	6.78
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	5.19
Lime manufacture	(2)	(2)	5.19
Total or average	603	3,130	5.19
Unspecified:[3]			
Reported	304	1,880	6.17
Estimated	670	4,300	6.39
Total or average	978	6,190	6.33
Grand total or average	3,530	22,500	6.38

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MAINE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	40	$416	$10.40
Filter stone	18	127	7.06
Other coarse aggregates	46	222	4.83
Total or average	104	765	7.36
Coarse aggregate, graded:			
Concrete aggregate, coarse	140	1,070	7.62
Bituminous aggregate, coarse	W	W	6.58
Bituminous surface-treatment aggregate	W	W	10.47
Railroad ballast	W	W	10.76
Other graded coarse aggregates	411	3,510	8.53
Total or average	551	4,570	8.30
Fine aggregate (-⅜ inch):			
Stone sand, concrete	97	666	6.87
Stone sand, bituminous mix or seal	(2)	(2)	7.85
Screening, undesignated	(2)	(2)	4.41
Other fine aggregates	138	967	7.01
Total or average	235	1,630	6.95
Coarse and fine aggregates:			
Graded road base or subbase	78	446	5.72
Crusher run or fill or waste	(3)	(3)	5.51
Other coarse and fine aggregates	1,510	10,300	6.81
Total or average	1,590	10,700	6.76
Chemical and metallurgical:			
Cement manufacture	(4)	(4)	5.56
Lime manufacture	(4)	(4)	5.56
Total or average	618	3,430	5.56
Unspecified:[5]			
Reported	1,050	6,850	6.55
Estimated	230	1,500	6.69
Total or average	1,270	8,360	6.57
Grand total or average	4,370	29,500	6.75

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a
MAINE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	820	$3,820	$4.66
Concrete products (blocks, bricks, pipe, decorative, etc.)	74	389	5.24
Asphaltic concrete aggregates and other bituminous mixtures	1,010	6,470	6.38
Road base and coverings[2]	2,440	11,500	4.30
Fill	1,140	4,280	3.77
Snow and ice control	315	1,560	4.93
Railroad ballast	34	222	6.54
Other miscellaneous uses[3]	9	84	9.46
Unspecified:[4]			
Reported	1,070	4,270	3.99
Estimated	3,500	15,000	4.25
Total or average	10,400	47,600	4.56

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes filtration.
[4]Reported and estimated production without a breakdown by end use.

TABLE 4b
MAINE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	880	$4,110	$4.67
Concrete products (blocks, bricks, pipe, decorative, etc.)	73	401	5.47
Asphaltic concrete aggregates and other bituminous mixtures	1,230	8,310	6.74
Road base and coverings[2]	2,290	10,500	4.59
Fill	895	2,450	2.73
Snow and ice control	420	2,010	4.80
Other miscellaneous uses[3]	31	246	8.02
Unspecified:[4]			
Reported	694	2,740	3.95
Estimated	4,300	18,000	4.22
Total or average	10,800	49,100	4.52

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes filtration and railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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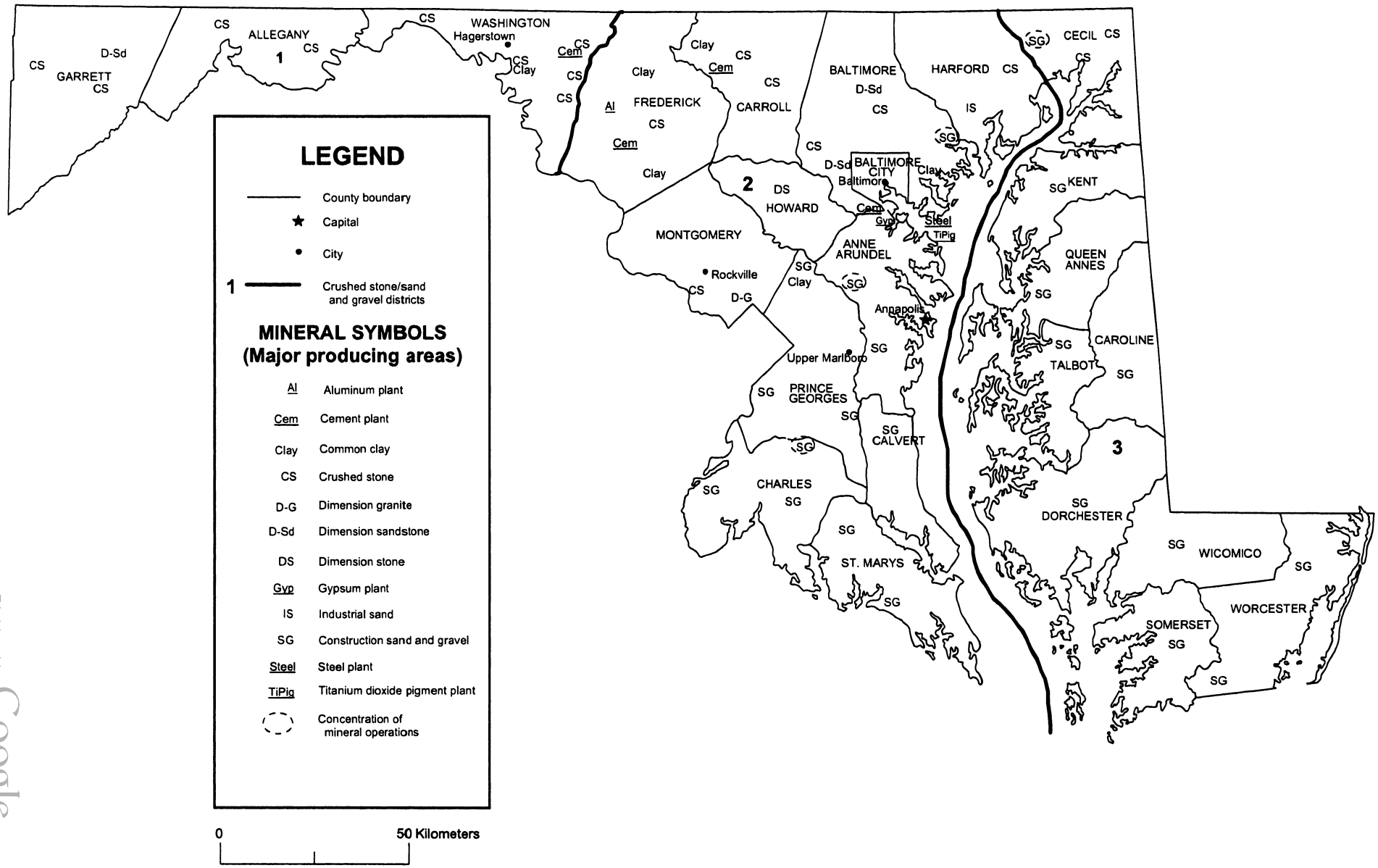
MARYLAND



Source: Maryland Department of the Environment/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MARYLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maryland Department of the Environment, Minerals, Oil, and Gas Division, for collecting information on all nonfuel minerals.

In 2004, Maryland's nonfuel raw mineral production was valued[1] at $481 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $54 million, up 12.6% from 2003,[2] which followed a $27 million or 7% increase from 2002. The State, for the third consecutive year, ranked 32d among the 50 States in total nonfuel raw mineral production value and accounted for slightly more than 1% of the U.S. total value.

Crushed stone, portland cement, and construction sand and gravel, based upon value, were Maryland's leading nonfuel raw mineral commodities. These three mineral commodities accounted for more than 90% of the State's total value (table 1). In 2004, increases in the production of portland cement, crushed stone, and dimension stone (average unit value up more than 200%), accounting for increases in value of $28 million, $20 million, and nearly $7 million, respectively, led the way in Maryland's rise in total nonfuel mineral value. Although construction sand and gravel production rose nearly 8%, its value decreased by $4.4 million. Increases in the value of crushed marble, shell, and traprock were, in part, offset by a decrease in the value of masonry cement.

In 2003, Maryland's rise in nonfuel mineral production value resulted from increases in the production of crushed stone, value up $24 million, and portland cement, up $7 million. The largest decrease in value resulted from a slightly more than 3% drop in construction sand and gravel production, its value down $3.6 million (table 1).

All nonfuel minerals mined in the Maryland were industrial minerals. In 2004, the State continued to be a producer of significant quantities of crushed stone, portland cement, construction sand and gravel, dimension stone, and common clays (descending order of value), as compared with other producing States. All metal production, especially that of primary aluminum and raw steel, consisted of the processing and refining of materials received from other domestic and foreign sources. Maryland rose to eighth from ninth among 12 States in the production of primary aluminum.

The narrative information that follows was provided by the Maryland Department of the Environment's (MDE) Mining Program.[3] Maryland's nonfuel mineral mining production has remained consistently high in recent years; in 2004, the State again set a new record high for the value of nonfuel mineral production. With crushed stone continuing to be the primary nonfuel mineral product that was mined in Maryland, followed by construction sand and gravel, the State's nonfuel mineral production continued to be mainly driven by increasing construction-related aggregate demands.

Mine Permitting and Expansions

Bardon Inc. was issued a new 194-hectare (ha) surface mine permit for its Accokeek Road construction sand and gravel mining project in southern Prince George's County near Washington, DC. Construction of a new on-site wash plant to process the materials from the sand and gravel pit was nearing completion. The site will serve as Bardon's main sand and gravel reserve for the rapidly developing southern Maryland area and for the metropolitan Washington, DC area. Operations began in 2004 for both mining and processing.

The Arundel Corp. was issued a permit modification to its Havre De Grace stone quarry in Harford County in northeastern Maryland. Arundel sought modification to its permit so as to provide additional overburden storage area and to allow for the reconfiguration of existing overburden storage areas currently placed over reserves. The modification will allow access to an estimated additional 25 to 30 years of reserves. Although the modification was for a relatively small tract of property, 19 ha, it was nevertheless the subject of significant vocal opposition in the surrounding area; a separate permit expansion request for the quarry involving an area twice the size had been withdrawn the previous year.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]C. Edmon Larrimore, Program Manager of the Mining Program of the Maryland Department of the Environment, authored the text of the State mineral industry information provided by that agency.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MARYLAND[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	1,880	140,000 e	2,200	147,000 e	2,520	175,000 e
Clays, common	268	550	269	550	262	571
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	12,200	83,500	11,800	79,900	12,700	75,500
Stone:						
Crushed[3]	22,300	141,000	26,200	165,000	29,900	185,000
Dimension	21	2,120	24	2,700	27	9,580
Combined values of cement (masonry), sand and gravel (industrial), stone (crushed marble, shell, traprock)	XX	33,500	XX	31,700	XX	35,400
Total	XX	400,000	XX	427,000	XX	481,000

eEstimated. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MARYLAND: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	18	16,900	$101,000	$5.96	19	18,700	$116,000	$6.19	19	21,400	$132,000	$6.14
Granite	4 r	5,280 r	39,200 r	7.42 r	4	7,390	48,000	6.50	4	8,320	52,500	6.31
Marble	1	W	W	5.62	1	W	W	5.62	1	W	W	5.62
Sandstone	2	60	411	6.85	2	81	566	6.95	2	79	543	6.87
Shell	1	W	W	3.97	1	W	W	6.09	1	W	W	6.09
Traprock	2	W	W	4.49	2	W	W	4.71	2	W	W	4.75
Miscellaneous stone	1 r	26 r	122 r	4.64 r	1	22	101	4.64	1	24	113	4.63
Total or average	XX	22,300	141,000	6.31	XX	26,200	165,000	6.28	XX	29,900	185,000	6.19

rRevised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$10.95
Riprap and jetty stone	65	$576	8.91
Filter stone	W	W	5.95
Other coarse aggregates	395	2,820	7.13
Total or average	460	3,390	7.38
Coarse aggregate, graded:			
Concrete aggregate, coarse	388	2,450	6.32
Bituminous aggregate, coarse	607	5,180	8.54
Bituminous surface-treatment aggregate	(2)	(2)	5.92
Railroad ballast	(2)	(2)	6.17
Other graded coarse aggregate	1,280	7,690	6.02
Total or average	2,270	15,300	6.74
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	9.10
Screening, undesignated	1,210	6,710	5.53
Other fine aggregate	489	4,070	8.32
Total or average	1,700	10,800	6.33
Coarse and fine aggregates:			
Graded road base or subbase	1,000	8,280	8.28
Crusher run or fill or waste	583	3,390	5.82
Roofing granules	(4)	(4)	6.69
Other coarse and fine aggregates	1,700	12,400	7.29
Total or average	3,280	24,100	7.33
Other construction materials	29	177	6.08
Agricultural limestone	(5)	(5)	6.69
Chemical and metallurgical:			
Cement manufacture	3,630	21,100	5.82
Chemical stone	(5)	(5)	6.69
Sulfur oxide removal	(5)	(5)	6.28
Unspecified:[6]			
Reported	14,400	86,800	6.05
Estimated	360	2,200	6.09
Total or average	14,700	89,000	6.05
Grand total or average	26,200	165,000	6.28

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates.

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$10.87
Riprap and jetty stone	538	$4,280	7.95
Coarse aggregate, graded:			
Concrete aggregate, coarse	705	4,070	5.77
Bituminous aggregate, coarse	984	7,750	7.88
Bituminous surface-treatment aggregate	(2)	(2)	5.85
Railroad ballast	(2)	(2)	5.81
Other graded coarse aggregate	917	7,420	8.09
Total or average	2,650	19,500	7.37
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	9.04
Stone sand, bituminous mix or seal	(2)	(2)	6.01
Screening, undesignated	476	2,680	5.63
Total or average	889	5,790	6.51
Coarse and fine aggregates:			
Graded road base or subbase	3,270	22,800	6.97
Crusher run or fill or waste	1,900	9,170	4.82
Other coarse and fine aggregates	1,630	9,820	6.01
Total or average	6,800	41,800	6.14
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	5.81
Sulfur oxide removal	(2)	(2)	6.28
Total or average	1,060	6,230	5.85
Unspecified:[3]			
Reported	15,200	91,600	6.01
Estimated	2,700	16,000	5.86
Total or average	17,900	107,000	5.99
Grand total or average	29,900	185,000	6.19

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	169	1,220	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	1,280	7,790	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Other construction materials	11	68	18	109	--	--
Agricultural[6]	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	W	W	--	--
Unspecified:[8]						
Reported	1,620	9,710	12,700	77,100	--	--
Estimated	180	1,100	170	1,100	--	--
Total	3,880	23,300	19,200	120,000	3,080	21,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, roofing granules, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, chemical stone, and sulfur oxide removal.

[8]Reported and estimated production without a breakdown by end use.

TABLE 4b

MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	1,350	9,550	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	1,280	7,450	3,440	22,900	2,080	11,400
Chemical and metallurgical[6]	W	W	W	W	--	--
Unspecified:[7]						
Reported	1,880	11,300	13,300	80,200	--	--
Estimated	180	1,100	2,500	15,000	--	--
Total	4,550	26,900	21,600	134,000	3,710	24,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes macadam and riprap and jetty stone.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), and stone sand (concrete).

[5]Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[6]Includes cement manufacture and sulfur oxide removal.

[7]Reported and estimated production without a breakdown by end use.

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TABLE 5a
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,640	$32,100	$6.92
Plaster and gunite sands	126	602	4.80
Concrete products (blocks, bricks, pipe, decorative, etc.)	115	1,100	9.58
Asphaltic concrete aggregates road base materials[2]	91	261	2.75
Fill	260	1,080	4.14
Other miscellaneous uses[3]	18	200	11.00
Unspecified:[4]			
Reported	3,310	23,700	7.18
Estimated	3,200	21,000	6.42
Total or average	11,800	79,900	6.77

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road base and other stabilization (lime).
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,550	$28,500	$5.14
Plaster and gunite sands	125	1,050	8.35
Concrete products (blocks, bricks, pipe, decorative, etc.)	632	4,640	7.34
Asphaltic concrete aggregates road base materials[2]	344	1,260	3.65
Fill	794	3,070	3.87
Other miscellaneous uses[3]	43	680	15.86
Unspecified:[4]			
Reported	4,620	32,800	7.10
Estimated	580	3,500	6.06
Total or average	12,700	75,500	5.96

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road base and other stabilization (cement).
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a

MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2[2]		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	2,190	17,400	2,690	16,400
Asphaltic concrete aggregates and road base materials	W	W	W	W
Fill	172	845	89	234
Other miscellaneous uses[4]	61	271	48	189
Unspecified:[5]				
Reported	3,270	23,500	33	240
Estimated	1,300	9,600	1,900	11,000
Total	7,010	51,600	4,780	28,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

TABLE 6b

MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	3,580	20,500	2,730	13,700
Asphaltic concrete aggregates and road base materials[4]	277	848	67	408
Fill	382	1,310	413	1,770
Other miscellaneous uses[5]	19	210	24	470
Unspecified:[6]				
Reported	4,330	30,900	284	1,900
Estimated	230	1,400	350	2,100
Total	8,820	55,100	3,860	20,400

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement).

[5]Includes snow and ice control.

[6]Reported and estimated production without a breakdown by end use.

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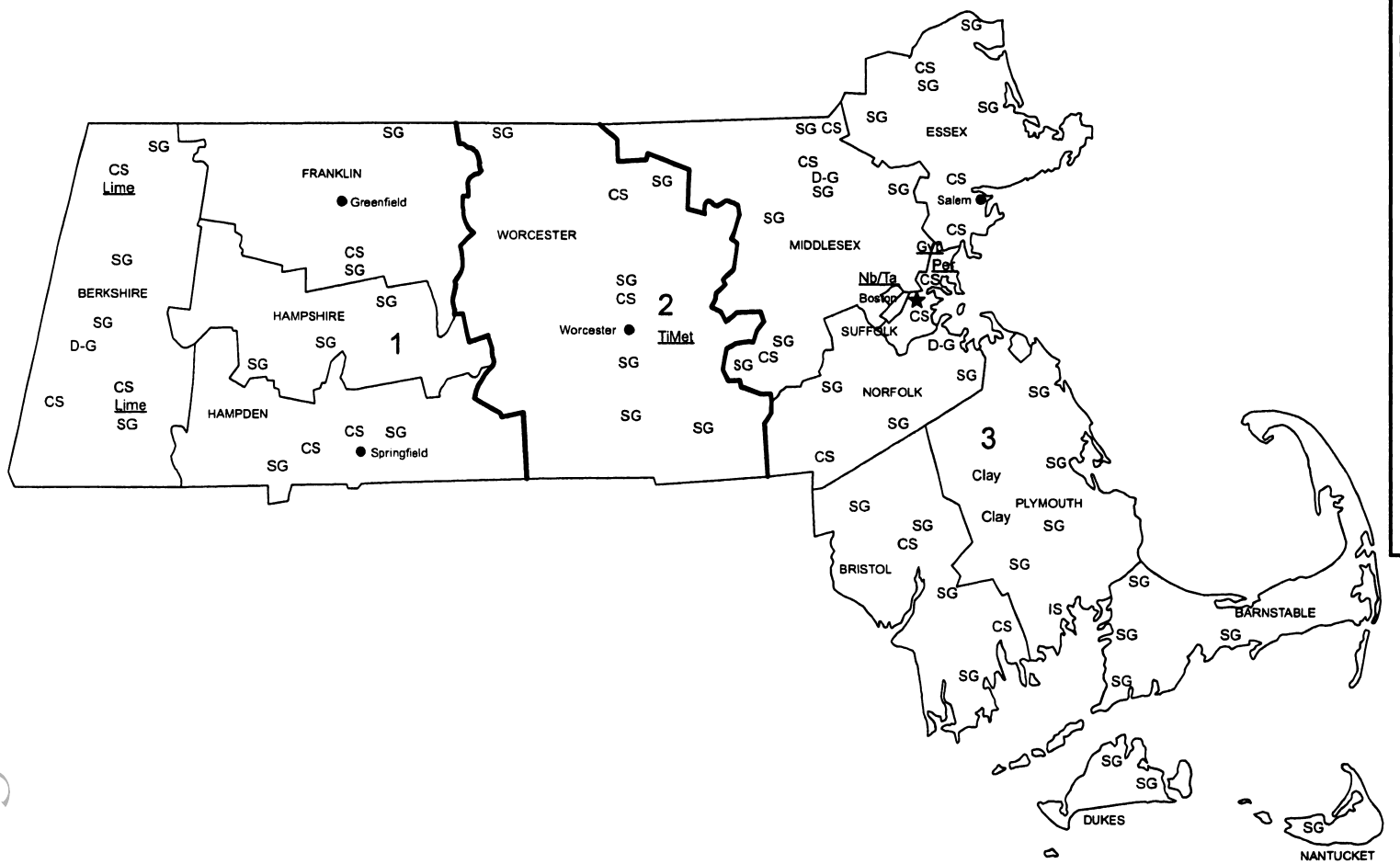
MASSACHUSETTS



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS

(Major producing areas)

Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
Nb/Ta	Columbium/tantalum plant
Per	Perlite plant
SG	Construction sand and gravel
TiMet	Titanium metal plant

0 20 Kilometers

Source: Massachusetts Executive Office of Environmental Affairs/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MASSACHUSETTS

In 2004, Massachusetts nonfuel raw mineral production was valued[1] at $210 million, based upon annual U.S. Geological Survey data. This was a 3% increase from that of 2003,[2] which was up about 3%, from 2002.

Massachusetts leading nonfuel mineral commodities by value were crushed stone, construction sand and gravel, and lime, the former two commodities accounting for about 95% of the State's total value. Because data for lime and common clays (2004) have been withheld, the State's actual total nonfuel mineral values for 2002-04 are higher than those reported in table 1.

In 2004, construction sand and gravel, with an 11.6% increase in production, had the largest increase in value, up nearly $9 million, leading to Massachusetts rise in total nonfuel mineral value for the year. This was offset somewhat by a $2 million decrease in the value of crushed stone, despite an increase in production of 4.6% (table 1). The value of dimension stone was up slightly and that of lime decreased by about $1 million. Common clays and gemstones were unchanged. In 2004, the State rose to fifth from sixth in the quantities of dimension stone produced, and additionally, Massachusetts quarries and sand pits produced significant quantities of crushed stone and construction sand and gravel.

In 2003, increased production of construction sand and gravel, value of which was up $5.6 million, also led the State's increase in value for the year. With the exception of lime, the value of which was up about $3 million, other mineral commodities were relatively unchanged (table 1).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MASSACHUSETTS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	36	321	36	321	36	(3)
Gemstones	NA	1	NA	1	NA	1
Lime	W	(3)	W	(3)	W	(3)
Sand and gravel, construction	12,200	75,300	12,900	80,800	14,400	90,000
Stone:						
Crushed	13,800	111,000 r	13,000	111,000	13,600	109,000
Dimension	81	11,300	81	11,300	82	11,600
Total	XX	198,000 r	XX	204,000	XX	210,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

[3]Value excluded to avoid disclosing company proprietary data.

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TABLE 2
MASSACHUSETTS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone[2]	3	977	$13,400	$13.74	2	1,050	$15,400	$14.75	2	983	$15,300	$15.54
Dolomite	1	W	W	4.46	1	W	W	12.68	1	W	W	12.39
Granite	9	5,350	40,000 r	7.46 r	10	4,900	37,300	7.61	9	3,850	29,300	7.61
Traprock	18	6,970	54,200	7.77	17	6,560	53,900	8.21	18	8,320	59,100	7.11
Miscellaneous stone	2	W	W	8.56	1	W	W	8.61	1	W	W	8.59
Total or average	XX	13,800	111,000 r	8.04 r	XX	13,000	111,000	8.59	XX	13,600	109,000	7.98

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3a
MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$10.03
Filter stone	W	W	8.83
Other coarse aggregates	121	$1,120	9.28
Total or average	136	1,270	9.37
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.29
Other graded coarse aggregates	W	W	7.05
Total or average	678	4,830	7.12
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	7.67
Screening, undesignated	W	W	8.84
Other fine aggregate	191	1,620	8.48
Total or average	252	2,090	8.29
Coarse and fine aggregates:			
Graded road base or subbase	W	W	14.64
Unpaved road surfacing	W	W	12.63
Crusher run or fill or waste	W	W	13.02
Total or average	368	4,780	12.98
Other construction materials, building products	(2)	(2)	27.27
Agricultural:			
Agricultural limestone	(2)	(2)	14.87
Poultry grit and and mineral food	(2)	(2)	14.87
Chemical and metallurgical:			
Lime manufacture	(2)	(2)	8.54
Dead burned dolomite	(2)	(2)	14.64
Flux stone	(2)	(2)	14.64
Special:			
Whiting or whiting substitute	(2)	(2)	14.64
Other fillers or extenders	(2)	(2)	60.08
Unspecified:[3]			
Reported	8,930	71,700	8.04
Estimated	1,900	14,000	7.52
Total or average	10,800	85,900	7.95
Grand total or average	13,000	111,000	8.59

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$7.68
Riprap and jetty stone	W	W	7.21
Filter stone	W	W	3.86
Other coarse aggregates	251	$2,050	8.15
Total or average	434	3,290	7.57
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	8.27
Bituminous aggregate, coarse	W	W	8.36
Bituminous surface-treatment aggregate	W	W	8.28
Railroad ballast	W	W	10.16
Other graded coarse aggregates	202	1,730	8.55
Total or average	1,460	12,200	8.36
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	6.93
Stone sand, bituminous mix or seal	W	W	4.87
Other fine aggregate	52	374	7.19
Total or average	1,090	5,600	5.14
Coarse and fine aggregates:			
Graded road base or subbase	W	W	7.59
Unpaved road surfacing	W	W	11.97
Crusher run or fill or waste	512	4,740	9.25
Other coarse and fine aggregates	48	568	11.83
Total or average	943	8,450	8.96
Other construction materials, building products	(2)	(2)	26.65
Agricultural:			
Agricultural limestone	(2)	(2)	14.90
Poultry grit and mineral food	(2)	(2)	15.05
Chemical and metallurgical:			
Lime manufacture	(2)	(2)	8.54
Dead burned dolomite	(2)	(2)	14.64
Flux stone	(2)	(2)	14.66
Special:			
Whiting or whiting substitute	(2)	(2)	14.64
Other fillers or extenders	(2)	(2)	58.08
Unspecified:[3]			
Reported	2,810	20,600	7.33
Estimated	6,200	46,000	7.42
Total or average	9,030	66,800	7.39
Grand toal or average	13,600	109,000	7.98

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	--	--	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregates[5]	W	W	W	W	W	W
Other construction materials[6]	W	W	--	--	--	--
Agricultural[7]	W	W	--	--	--	--
Chemical and metallurgical[8]	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--
Unspecified:[10]						
Reported	1,680	13,000	1,030	9,120	6,210	49,600
Estimated	290	2,100	580	4,300	1,000	7,700
Total	2,770	28,700	1,940	16,700	8,240	65,900

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone, filter stone, and other coarse aggregates.

[3]Includes concrete aggregate (graded) and other graded coarse aggregates.

[4]Includes stone sand (concrete), screening (undesignated), and other fine aggregate.

[5]Includes crusher run (select material or fill), graded road base or subbase, and unpaved road surfacing.

[6]Includes building products.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes lime manufacture, dead-burned dolomite, and flux stone.

[9]Includes whiting or whiting substitute and other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b

MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W
Other construction materials[6]	W	W	--	--	--	--
Agricultural[7]	W	W	--	--	--	--
Chemical and metallurgical[8]	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--
Unspecified:[10]						
Reported	1,550	12,000	369	3,010	889	5,610
Estimated	130	970	600	4,500	5,500	41,000
Total	2,790	28,900	2,300	17,300	8,550	62,500

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes macadam, filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast, and other graded coarse aggregates.

[4]Includes stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes building products.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes lime manufacture, dead-burned dolomite, and flux stone.

[9]Includes whiting or whiting substitute and other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

TABLE 5a

MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,570	$16,600	$6.46
Plaster and gunite sands	106	938	8.87
Concrete products (blocks, bricks, pipe, decorative, etc.)	43	357	8.30
Asphaltic concrete aggregates and other bituminous mixtures	205	2,540	12.40
Road base and coverings	599	4,020	6.72
Fill	1,320	4,500	3.39
Snow and ice control	249	1,790	7.20
Other miscellaneous uses[2]	62	488	7.84
Unspecified:[3]			
Reported	1,540	9,270	6.01
Estimated	6,200	40,000	6.47
Total or average	12,900	80,800	6.26

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes filtration.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 5b
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,560	$13,500	$8.63
Plaster and gunite sands	75	811	10.80
Concrete products (blocks, bricks, pipe, decorative, etc.)	458	4,480	9.79
Asphaltic concrete aggregates and other bituminous mixtures	219	1,830	8.38
Road base and coverings	824	3,870	4.70
Fill	1,200	4,100	3.40
Snow and ice control	219	1,480	6.77
Other miscellaneous uses[2]	203	800	3.94
Unspecified:[3]			
Reported	1,450	9,150	6.31
Estimated	8,200	50,000	6.07
Total or average	14,400	90,000	6.23

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6a
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	379	2,540	696	3,390	1,640	12,000
Asphaltic concrete aggregates and road base materials	199	2,560	326	2,370	279	1,650
Fill	233	681	309	872	782	2,940
Snow and ice control	83	703	75	514	91	573
Other miscellaneous uses[3]	18	172	44	316	--	--
Unspecified:[4]						
Reported	1,150	6,950	9	43	379	2,280
Estimated	1,100	6,100	1,600	8,900	3,600	25,000
Total	3,120	19,700	3,010	16,400	6,800	44,600

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes filtration.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6b
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	W	W	1,520	15,000
Asphaltic concrete aggregates and road base materials	W	W	634	2,400	W	W
Fill	268	911	369	1,020	566	2,160
Snow and ice control	W	W	105	546	W	W
Other miscellaneous uses[3]	441	4,120	549	2,400	311	2,290
Unspecified:[4]						
Reported	795	3,730	278	1,700	376	3,720
Estimated	1,200	7,300	2,300	12,000	4,700	30,000
Total	2,750	16,100	4,220	20,500	7,480	53,400

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes filtration.
[4]Reported and estimated production without a breakdown by end use.

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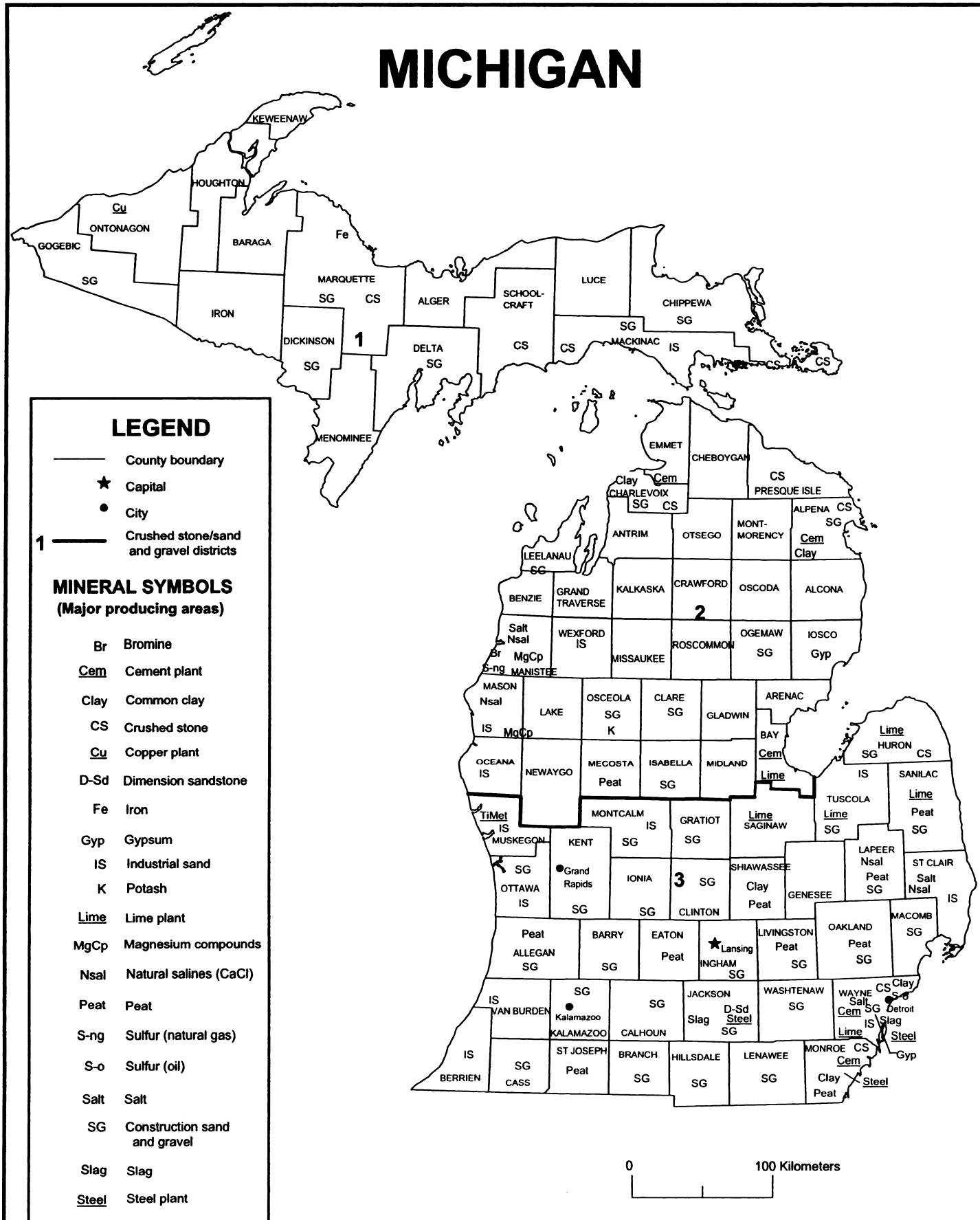
MICHIGAN



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Br	Bromine
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper plant
D-Sd	Dimension sandstone
Fe	Iron
Gyp	Gypsum
IS	Industrial sand
K	Potash
Lime	Lime plant
MgCp	Magnesium compounds
Nsal	Natural salines (CaCl)
Peat	Peat
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Slag	Slag
Steel	Steel plant
TiMet	Titanium metal plant

Source: Michigan Department of Environmental Quality, Office of the Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MICHIGAN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Michigan Department of Environmental Quality, Office of the Geological Survey, for collecting information on all nonfuel minerals.

In 2004, Michigan's nonfuel raw mineral production was valued[1] at $1.67 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 5.7% increase from that of 2003[2] and followed a 6.8% increase in 2003 from 2002. The State was ninth in rank (seventh in 2003) among the 50 States in total nonfuel mineral production value, of which Michigan accounted for nearly 3.7% of the U.S. total.

In 2004, Michigan continued to be the Nation's second leading iron ore-producing State, and, based upon value, iron ore once more became Michigan's leading nonfuel mineral commodity, followed by portland cement. After decades of iron ore being the State's leading nonfuel mineral commodity, portland cement led the State in total nonfuel mineral value from 1999-2003. Following portland cement were, in descending order of value, construction sand and gravel, salt, crushed stone, magnesium compounds, and masonry cement. These, the State's leading nonfuel minerals, combined, accounted for approximately 95% of the State's nonfuel raw mineral production value (table 1).

In 2004, iron ore and portland cement led Michigan's increase in value, up by nearly $60 million and $45 million, respectively. A more than 10% increase in the State's shipments of iron ore, supported by a substantially higher average price per metric ton than in 2003, resulted in the commodity's considerable increase in value for the year. The rise in the average price of a metric ton of portland cement also far outpaced its increase in production, resulting in its significant increase in value for the year. Significant increases also took place in crushed stone, up $17 million; in salt, up about $12 million; and in masonry cement and potash, up about $3 million each. The most substantial decreases in value were those of magnesium compounds, down more than $40 million, and industrial sand and gravel, down by about $6 million. All other changes were about $1 million or less, having comparatively minimal effect on the State's overall change in total value.

In 2003, the production and values of salt and magnesium compounds increased, the values of which were up more than $12 million each. The production and value of common clays were also up, with the value up more than $2 million. But these were outweighed by production and value decreases that took place in crushed stone, value down $48 million; construction sand and gravel, down $14 million; portland cement, down about $12 million; and lime, down about $9 million. Also down were the production and values of masonry cement and gypsum, values of which decreased by about $6 million and $5 million, respectively. Iron ore production had a small increase, but the nonfuel mineral's value was down by about $2 million (table 1).

In 2004, Michigan continued to be first in the quantities of magnesium compounds produced and second in iron ore, bromine (of two bromine-producing States), peat, and second of four States that produce iron oxide pigments (mineral commodities listed in descending order of value). The State also remained third of three States that produce potash, fourth in portland cement, and seventh in salt. The State rose to 10th from 12th in gypsum but decreased to 4th from 3d in construction sand and gravel, to 9th from 8th in masonry cement, and to 6th from 2d in the production of industrial sand and gravel. Additionally, the State was a significant producer of common clays and crushed stone. Michigan continued to be fourth in the Nation in the manufacture of raw steel with an output of about 5.84 million metric tons (Mt) (American Iron and Steel Institute, 2005, p. 76).

The following narrative information was provided by the Michigan Department of Environmental Quality (MDEQ), Office of the Geological Survey (MOGS), and the Michigan Department of Natural Resources (MDNR), Forestry, Mineral, and Fire Management Division[3] (FMFM). Production and other data and information in the following text are those reported by the MOGS and the MDNR, based upon those agencies' own research, surveys, and estimates. Mineral production data may differ from some production figures reported to the USGS.

Exploration and Development

In 2004, there were no active underground metal mines operating in Michigan. Kennecott Minerals Company (a subsidiary of London-based Rio Tinto Plc with headquarters in Salt Lake City, UT) considered developing of an underground nickel-copper mine in the Yellow Dog Plains area of Marquette County (Jackman, 2005). In October 2003, Kennecott formally announced the startup of its evaluation program, now called the Eagle Project (Rebers, 2003§[4]; Federal Reserve Bank of Minneapolis, 2004§). In response to concerns from environmentalists and local residents, Kennecott established a

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]The text of the State mineral industry information was compiled and edited by Milton A. Gere, Jr., Geologist and Supervisor, Metallic and Nonmetallic Minerals and Underground Gas Storage Leasing Unit, Minerals and Land Management Section, Forest, Mineral, and Fire Management Division, Michigan Department of Natural Resources, and Joseph R. Maki, Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality, with further editing and review by Harold R. Fitch, Director and State Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality.

[4]References that include a section mark (§) are found in the Internet References Cited section.

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community advisory group to provide advice and share ideas about the project. On April 1, 2004, the Eagle Project was advanced from an exploration project to a potential development project. The proposed mine site is about 40 kilometers northwest of the city of Marquette. Kennecott geologists estimated that the deposit contained 5 Mt of sulfide ore grading 3.5% nickel and 3.0% copper. Kennecott was conducting economic, engineering, and environmental studies to determine the feasibility of the project. The deposit lies 76 meters (m) to 350 m below the surface. The proposed mine would be the only primary nickel mine in the United States (Kennecott Minerals Company, 2004a).

Four companies drilled approximately 60 exploration holes in the western Upper Peninsula (UP) that totaled approximately 16,000 m in depth. These holes were drilled on private and State leases. Four exploration companies were actively exploring for minerals in the UP: Dunsmuir Ventures Ltd., Kennecott Exploration Company, Prime Meridian Resources, and Trans Superior Resources/Bitterroot Resources. Exploration activities included geophysical surveys, geologic mapping, and geochemical sampling. Exploration targets included copper, nickel, platinum-group metals, uranium, and zinc.

Minerals Processing Corporation (Duluth, MN) continued to evaluate a massive sulfide deposit in Menominee County containing copper, gold, silver, and zinc mineralization. The deposit is west of Stephenson in Lake Township (Quigley, 2006§).

Commodity Review

Industrial Minerals

Limestone and Dolomite.—Lafarge North America's Presque Isle Quarry was awarded the 2004 Environmental Eagle Award for Excellence and the 2004 Community Relations Pinnacle Award by the National Stone, Sand and Gravel Association (NSSGA).

Oglebay Norton Co., a major producer of limestone and dolomite in Michigan, filed voluntary petitions for reorganization under Chapter 11, U.S. Bankruptcy Code. The company continued to operate and, by yearend, had been cleared to emerge from Chapter 11 protection by the Federal courts.

In what had been referred to as "a creative reclamation project," a golf course developer announced plans to build an 18-hole public course on 81 hectares (ha) above the former Georgia Pacific Gypsum Mine. In the past, subsidence had caused sinkholes to develop over the old underground workings, and the property was determined to be too unstable for use as an expansion of the nearby county-owned zoo. The golf course plans include a clubhouse with a mine theme.

Michigan Natural Storage Company, Wyoming, MI, has been using the old Alabastine Mining Company underground gypsum mine tunnels to store food products for industry for many years. In 2001, they added storage spaces for electronic data as well as other items.

Sand and Gravel.—Michigan continued to see increasing regulatory oversight by local units of government in the decision where to locate and how to operate sand and gravel pits, particularly in the southwestern part of the State. The main concerns were dust, land-use conflicts, and noise. Reclaimed sites are increasingly being used for housing developments and other purposes, including wetland mitigation areas.

Glass recyclers were selling crushed recycled glass to replace sand and zeolite as filtering material for water for drinking water, fish farms, and pools. The crushed glass replaced natural sand.

Metals

Iron and Steel.—OAO Severstal-auto, a Russian steelmaker, completed its purchase of the assets of Rouge Steel Company (a subsidiary of Rouge Industries, Inc.) and assumed its iron pellet contract with Crown Castle International (CCI) through 2012. Severstal also announced agreements for Rouge's interests in other steel ventures (Skillings Mining Review, 2004). Rouge Steel was the fifth leading steel producer in the United States.

Stelco Incorporated, Hamilton, Ontario, Canada, received approval for Ontario Court Protection. Stelco owns 15% of the Tilden Mining Company, L.C., an UP Michigan iron mine operated by CCI. Because of a potential strike, Stelco received notice in mid-October that General Motors would proceed with plans for another source of steel in 2005 and that Daimler Chrysler was seeking another source too (Stelco Inc., 2004§).

CCI filed a Securities and Exchange Commission report indicating a 75% reduction in the iron ore reserve estimate for Empire Mine. The reserve dropped from 118 Mt in 2002 to 64 Mt in 2003 to 29 Mt in 2004; however, ongoing studies of production rates and satellite mineral resources could increase the mine's reserve base. Closing would incur significant closure and reclamation along with other obligations.

Employees in the United Steelworkers of America union ratified a new contract with CCI. The contract covered 1,200 employees at the Empire and Tilden Mines in Michigan and 800 at two mines in Minnesota. Contract provisions include a 9% wage increase during 4 years, sharing of health insurance costs, and workforce flexibility conditions. The union was given the opportunity to nominate a member to the CCI Board of Directors.

The 2003 shipping season was extended by the U.S. Coast Guard's Operation Taconite. The Edgar B. Speer, a 300-m-long ore carrier, got stuck in ice in the St. Mary's River for more than 3 days, and several other ships upriver had to lighten their loads to allow passage. On January 25, 2004, the last ship of the 2003 shipping season cleared the Soo Locks. The 2004 shipping season opened on March 25, 2004, with ships moving towards the Soo Locks from both directions. Four icebreakers were grooming channels above and below the locks.

Two Great Lakes iron ore shipping docks continued to operate in Michigan. CCI's 370 m long ore dock on Lake Superior at Marquette primarily handled ore from the Tilden Mine. The Canadian National Railway ore dock at Escanaba on Lake Michigan primarily loaded ore from Empire, but also transferred some ore by railroad from the Mesabi Range in Minnesota.

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Government Activities, Legislation, and Programs

During the fiscal year ending September 30, 2004, the MDNR issued 49 direct metallic mineral leases for 5,023 ha of State-owned minerals in the western part of the UP. Another group of lease applications were placed on hold while the metallic mineral lease document and associated policy and procedures were reviewed. The MDNR approved 10 exploration plans for State leases, including ground-based geophysical surveys and corehole drilling programs.

Thirteen leases covering 1,198 ha were released. One hundred and fifty-three leases covering 13,696 ha were in effect. The metallic program accounted for an income of $821,635 from rentals and bonus payments and other fees. No royalties were received as no leases were in production. Companies holding metallic mineral leases were BHP Minerals International Exploration, Inc., Cleveland Cliffs Inc (CCI), Kennecott Minerals Company, Minerals Processing Corporation, Prime Meridian Resources, Inc., Trans Superior Resources, Inc., and Yooper Exploration Company.

The nonmetallic mineral leasing program covered leases for construction sand and gravel, limestone/dolomite, and salt. Thirteen leases in effect during fiscal year 2004 covered 750 ha. Also, 22 nonmetallic leases were issued, and one was released. The nonmetallic program produced revenue of almost $5.4 million in 2004.

A short-term mine mapping and evaluation project in the inactive Adventure Mine near Greenland in Ontonagon County was done in February. No significant copper mineralization was observed. Tours of the Adventure Mine were offered for a fee by the owner of the private portion of the mine and included the State-owned portion under a DNR Use Permit.

Potential development of new metallic mining operations in the western UP created significant controversy and prompted concerns over the adequacy of Michigan's mining and reclamation laws and regulations. In response to those concerns and at the request of UP legislators, the MDEQ established a work group to evaluate Michigan's regulation of hard-rock mining. The work group included business organizations, citizens, interest groups, legislators, local governmental units, mining companies, Native American tribes, universities, the U.S. Environmental Protection Agency, and other State government agencies. The work group drafted language for a comprehensive, progressive mining law, which was later incorporated into Public Act No. 449 of 2004. The new law, enacted on December 27, 2004, regulates for the first time the underground mining of sulfide ores for nonferrous metals. The new law was designed to protect the environment, while ensuring that mining companies could develop economically promising sulfide deposits in Michigan. The legislation also amended and updated Michigan's earlier mining reclamation law (Public Act No. 451 of 1994), which applies primarily to open pit mining of iron ore. The new law represents a compromise between the mining industry and environmental groups and was triggered by the exploration activities of Bitterroot Resources, Ltd. and Kennecott in the UP (Eggert, 2004§; Flesher, 2004§). Kennecott supported the underground mining legislation during the enactment process (Kennecott Minerals Company, 2004b).

Although mining of native copper in the Keweenaw-Houghton area of the UP began in 1844, Michigan had no law prior to 2005 that specifically regulated the development and operation of underground native copper or sulfide mines. The new law also requires a mining company to restore the mine site to its original, self-sustaining condition when mining ceases.

The new mining law set up a permitting system to oversee underground sulfide mining. The MDEQ was to be responsible for issuing the permits. Public hearings must be held during the review of all permit applications. As part of the application process, mining companies must submit plans to the MDEQ that cover all aspects of development, operation, monitoring, and decommissioning. The MDEQ had until December 31, 2005, to create more specific rules for mine construction, operation, and decommissioning. The MDEQ was expected to initially focus on minimizing the generation of acid mine drainage (AMD) waters and preventing their escape offsite. Conservation groups and residents of the UP were especially concerned about AMD contaminating ground water or environmentally sensitive surface waters (Sierra Club Mackinac Chapter, 2005§).

A number of mining and mineral tours and attractions continued to operate in the UP. These included the following: historic Quincy Mine Hoist and Mine tour, Hancock; historic Delaware Mine tour, Delaware location, Keweenaw County; historic Adventure Mine tour, Greenland, Ontonagon County; historic Iron Mountain Iron Mine tour, Vulcan; the currently active Tilden Mine and Mill tour, Ishpeming; Michigan Iron Industry Museum, Negaunee; historic Cliffs Shaft Mine Museum, Ishpeming; historic Cornish Mine Pump Museum tour, Iron Mountain; Fayette State Park (a restored historic iron processing town), Delta County; Seaman Mineral Museum, Michigan Technological University, Houghton; and historic Iron County Museum, Iron River.

More information about the MDNR was available on the Web site at URL http://www.michigan.gov/dnr; information and maps related to State-owned lands and minerals and leasing are available onsite. Information and maps related to State environmental and mining regulations, geologic programs, and offered publications were available on the MDEQ Web site at URL http://www.michigan.gov/deq.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, masonry	292	30,000 e	237	24,300 e	231	27,100 e
Clays, common	499	884	588	3,050	605	3,070
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	1,020	10,800	500	6,130	452	5,660
Peat	131	3,790	125	3,460	122	3,360
Sand and gravel:						
Construction	77,300	267,000	71,000	253,000	69,500	254,000
Industrial	2,210	31,000	2,130	31,400	1,690	25,200
Stone, crushed[3]	41,100	171,000 r	33,600	123,000	35,800	140,000
Combined values of bromine, cement (portland), iron ore (usable), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone (crushed marl and miscellaneous, dimension dolomite and sandstone)	XX	962,000	XX	1,140,000	XX	1,210,000
Total	XX	1,480,000 r	XX	1,580,000	XX	1,670,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MICHIGAN: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	24 r	34,300 r	$144,000 r	$4.19 r	22	27,600	$98,300	$3.56	22	27,900	$105,000	$3.74
Dolomite	5 r	6,820 r	26,700 r	3.92 r	5	5,980	25,200	4.21	5	7,860	35,300	4.49
Calcareous marl	1	W	W	4.41	1	W	W	4.41	1	W	W	4.41
Sandstone	1	11	891 r	82.68 r	--	--	--	--	--	--	--	--
Miscellaneous stone	1	W	W	3.41	1	W	W	3.71	1	W	W	3.70
Total or average	XX	41,100	171,000 r	4.16 r	XX	33,600	123,000	3.67	XX	35,800	140,000	3.91

rRevised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

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TABLE 3a

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	119	$1,800	$15.15
Filter stone	W	W	6.81
Other coarse aggregates	39	308	7.90
Total or average	158	2,110	13.36
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,980	10,700	3.59
Bituminous aggregate, coarse	202	1,130	5.59
Bituminous surface-treatment aggregate	(2)	(2)	8.48
Railroad ballast	(2)	(2)	7.07
Other graded coarse aggregate	1,410	9,040	6.43
Total or average	4,590	20,900	4.55
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	3.31
Stone sand, bituminous mix or seal	(3)	(3)	4.44
Screening, undesignated	243	891	3.67
Other fine aggregate	803	3,370	4.20
Total or average	1,050	4,260	4.07
Coarse and fine aggregates:			
Graded road base or subbase	2,860	12,400	4.33
Unpaved road surfacing	682	3,860	5.67
Crusher run or fill or waste	28	245	8.75
Other coarse and fine aggregates	39	170	4.36
Total or average	3,610	16,700	4.62
Agricultural limestone	150	1,090	7.27
Chemical and metallurgical:			
Cement manufacture	5,760	10,100	1.75
Lime manufacture	(4)	(4)	3.31
Flux stone	(4)	(4)	3.68
Total or average	8,480	19,600	2.31
Special, other fillers or extenders	(5)	(5)	1.92
Unspecified:[6]			
Reported	13,600	51,500	3.79
Estimated	2,000	7,400	3.70
Total or average	15,600	58,900	3.78
Grand total or average	33,600	123,000	3.67

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[5]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	392	$3,260	$8.30
Filter stone	41	333	8.12
Other coarse aggregates	890	1,540	1.73
Total or average	1,320	5,130	3.88
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,460	21,800	4.87
Bituminous aggregate, coarse	1,120	6,100	5.47
Bituminous surface-treatment aggregate	W	W	7.77
Railroad ballast	W	W	6.82
Other graded coarse aggregates	16	144	9.00
Total or average	5,680	28,600	5.03
Fine aggregate (-¾ inch):			
Stone sand, concrete	(2)	(2)	5.46
Stone sand, bituminous mix or seal	568	2,330	4.11
Screening, undesignated	540	1,950	3.61
Total or average	1,110	4,280	3.87
Coarse and fine aggregates:			
Graded road base or subbase	3,660	17,200	4.70
Unpaved road surfacing	W	W	6.32
Crusher run or fill or waste	W	W	2.08
Other coarse and fine aggregates	797	3,510	4.41
Total or average	4,470	20,800	4.65
Agricultural limestone	242	1,500	6.20
Chemical and metallurgical:			
Cement manufacture	W	W	1.79
Lime manufacture	W	W	3.95
Flux stone	W	W	3.99
Total or average	9,150	26,500	2.90
Unspecified:[3]			
Reported	12,000	44,000	3.67
Estimated	1,800	9,100	4.95
Total or average	13,800	53,000	3.84
Grand total or average	35,800	140,000	3.91

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	124	1,820
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	3	23	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	923	1,730
Special[8]	--	--	(9)	(9)	--	--
Unspecified:[10]						
Reported	1,540	5,770	8,610	32,900	3,440	12,900
Estimated	--	--	590	2,200	1,400	5,200
Total	7,680	27,300	14,600	46,000	11,400	50,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes stone sand (concrete), stone sand bituminous mix or seal, screening (undesignated), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, flux stone, and lime manufacture.

[8]Includes other fillers or extenders.

[9]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[10]Reported and estimated production without a breakdown by end use.

TABLE 4b

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	47	310	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	2,560	15,500
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	3,200	15,200
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	--	--
Unspecified:[8]						
Reported	--	--	9,250	35,400	2,510	7,360
Estimated	--	--	110	2,700	1,700	6,400
Total	9,650	39,500	15,200	49,700	11,000	50,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes stone sand (concrete), stone sand bituminous mix or seal, and screening (undesignated).

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, flux stone, and lime manufacture.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,580	$35,800	$4.18
Plaster and gunite sands	71	518	7.33
Concrete products (blocks, bricks, pipe, decorative, etc.)	671	3,540	5.27
Asphaltic concrete aggregates and other bituminous mixtures	3,850	16,600	4.31
Road base and coverings	8,890	29,300	3.30
Road and other stabilization (cement and lime)	412	1,510	3.66
Fill	6,890	16,200	2.35
Snow and ice control	628	2,470	3.94
Railroad ballast	2	11	5.50
Filtration	436	1,230	2.81
Other miscellaneous uses	290	1,840	6.32
Unspecified:[2]			
Reported	22,800	80,400	3.53
Estimated	18,000	63,000	3.60
Total or average	71,000	253,000	3.56

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 5b
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,100	$38,100	$3.75
Plaster and gunite sands	79	551	6.95
Concrete products (blocks, bricks, pipe, decorative, etc.)	360	1,520	4.23
Asphaltic concrete aggregates and other bituminous mixtures	4,980	26,600	5.33
Road base and coverings	7,460	27,400	3.67
Road and other stabilization (cement and lime)	366	1,270	3.47
Fill	4,670	10,800	2.32
Snow and ice control	459	1,600	3.48
Railroad ballast	101	374	3.71
Filtration	55	394	7.14
Other miscellaneous uses	314	1,900	6.05
Unspecified:[2]			
Reported	9,090	31,800	3.50
Estimated	31,000	112,000	3.56
Total or average	69,500	254,000	3.66

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 6a

MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	228	1,600	1,090	4,090	7,270	30,100
Plaster and gunite sands	W	W	W	W	69	506
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	W	W	539	2,970
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	2,810	12,400
Road base and coverings[2]	728	2,410	2,070	6,980	6,510	21,400
Fill	664	849	524	1,020	5,700	14,300
Snow and ice control	25	96	277	596	325	1,780
Other miscellaneous uses[3]	23	94	1,400	5,500	475	2,260
Unspecified:[4]						
Reported	75	168	401	1,410	22,300	78,800
Estimated	1,400	6,100	4,400	17,000	12,000	40,000
Total	3,120	11,300	10,100	36,600	57,800	205,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road and other stabilization (cement and lime).

[3]Includes filtration and railroad ballast.

[4]Reported and estimated production without a breakdown by end use.

TABLE 6b

MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	821	2,370	837	3,260	8,480	32,400
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	418	1,990
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	3,680	21,500
Road base and coverings[3]	622	2,170	2,290	7,300	4,910	19,200
Fill	187	279	254	426	4,230	10,100
Snow and ice control	40	93	126	329	294	1,180
Other miscellaneous uses[4]	75	209	1,280	5,180	440	2,400
Unspecified:[5]						
Reported	26	108	398	1,540	8,670	30,200
Estimated	1,700	6,100	3,800	15,000	26,000	91,000
Total	3,440	11,300	8,990	32,800	57,100	210,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration and railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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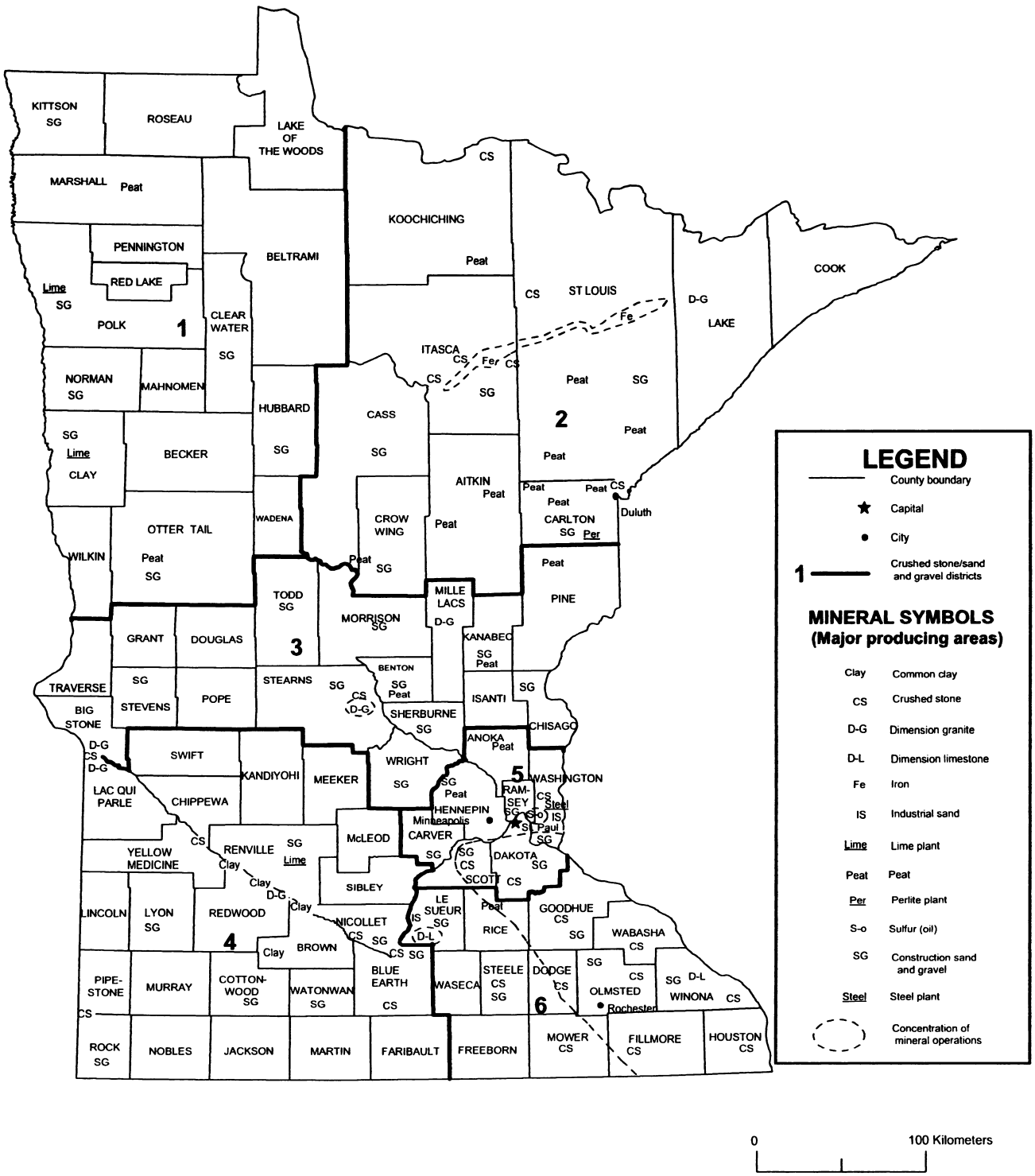
MINNESOTA



Source: Minnesota Department of Natural Resources, Division of Lands and Minerals/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MINNESOTA

In 2004, Minnesota's nonfuel raw mineral production was valued[1] at $1.89 billion, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 43% increase from that of 2003[2] and followed a 1.5% increase from 2002 to 2003. The State rose to 7th from 10th in rank among the 50 States in total nonfuel mineral production value, of which Minnesota accounted for about 4.1% of the U.S. total. (Because data for industrial sand and gravel and lime have been withheld to protect company proprietary data, the actual total values for 2002-04 are somewhat higher than those reported in table 1.)

Minnesota continued to be the Nation's leading iron ore-producing State in 2004; based upon value, iron ore continued to be the State's leading nonfuel raw mineral, followed by construction sand and gravel, crushed stone, industrial sand and gravel, dimension stone, and lime (descending order of value). The State's substantial increase in nonfuel raw mineral production value largely resulted from iron ore's considerably higher average price per metric ton in 2004 as compared with that of 2003. With a 22% increase in production shipments, the commodity's value rose by more than $530 million, more than 50% from that of 2003. Other particularly significant increases were those of crushed stone, the value of which was up by $6.5 million, construction sand and gravel, value up $24 million, and industrial sand and gravel, up more than $10 million. There were no decreases in production or related value for any of Minnesota's nonfuel minerals for the year.

In 2003, a $37 million increase in the value of construction sand and gravel and a more than $4 million increase in crushed stone more than offset a $20 million decrease in the value of iron ore, in part resulting from lowered production shipments of iron ore (table 1). Additionally, with significantly increased production, industrial sand and gravel value was up about $8 million, and although with a slight drop in crushed stone production, its value increased by more than $4 million. Lime had a small increase in production, but its value was down slightly.

In 2004, Minnesota continued to rank first in the quantities of iron ore produced, third in peat, and fifth in construction sand and gravel among other producing States. The State increased to 9th from 10th in the production of industrial sand and gravel and significant quantities of dimension stone were produced in the State.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The following narrative information was provided by the Minnesota Department of Natural Resources' (DNR) Division of Lands and Minerals (DLM).[3] Production data in the following text are those reported by the DLM, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS.

Exploration and Nonferrous Metallic Leasing Activities

Advanced stage exploration continued in 2004 at three copper-nickel-platinum-group metal (PGM) deposits located near the western margin of late-Proterozoic mafic intrusions collectively referred to as the Duluth Complex. The three deposits were the NorthMet deposit, being explored by Polymet Mining Corp.; the Birch Lake deposit, being explored by Franconia Minerals Corp.; and the Mesaba deposit, held by Teck Cominco Ltd.

Polymet has formally begun the permitting process for the NorthMet deposit, and in early 2005, announced a 27,000-meter (m) infill drilling in the deposit area designed to add to the existing 56,000 m of existing drill core. A second large-diameter core sampling campaign was to provide raw materials for a second pilot test of Polymet's processing technology. Additional program information was available on the Internet at URL http://www.polymetmining.com.

The Birch Lake project, according to a 2004 technical report released by Franconia Minerals Corp., was at an advanced exploration stage. Drilling (40 holes and 49 wedges totaling 33,339 m) has outlined a large-tonnage, low-grade copper-nickel-PGE deposit in a resource area of approximately 260 hectares (ha). The deposit is in the upper portion of an ultramafic unit within the South Kawishiwi intrusive, at a depth of 350 m to 750 m in the resource area. The vertical thickness of the unit averages 53 m with mineralization consisting of disseminated sulfides. The palladium-to-platinum ratio is typically 2 to 1 in drill-core analyses. A 2002 estimate of inferred mineral resources (using a hydrometallurgical case and net smelter return cutoff of U.S. $25.35 per metric ton) described 51 million metric tons (Mt) of inferred resources at a grade of 0.675% copper, 0.211% nickel, 0.01% cobalt, 216 parts per billion (ppb) gold, 972 ppb palladium, 460 ppb platinum, and 2.60 parts per million silver. Additional information was available on the company's Web site at URL http://www.franconiaminerals.com.

The Mesaba deposit being explored near Babbitt, MN, had been dormant since Polymet announced that it had reached an agreement with Cliffs-Erie LLC for use of the former LTV Steel mining and plant facilities at nearby Hoyt Lakes. The metals were to have been recovered using Teck Cominco's hydrometallurgical process. Additional information was

[3]Maryanna Harstad, Senior Planner, authored the text of the State mineral industry information provided by the Minnesota Department of Natural Resources' Division of Lands and Minerals.

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available on the company's Web site at URL http://www.teckcominco.com/research/index.htm.

In other exploration activities, Kennecott Minerals drilled 11 holes totaling 3,600 m in mafic-ultramafic features outside the Duluth complex, in Aitkin, Carlton, Morrison, and Stearns Counties. WMC Exploration Inc. drilled one hole in Renville County totaling 370 m. There were 143 active State metallic minerals leases covering 18,900 ha as of December 31, 2004. A State metallic minerals lease sale was held on October 13, 2004, that resulted in 37 new leases. Fifteen of these were in Kanabec County (all by Kennecott Exploration Co., covering a total of 2,490 ha), 18 were in Mille Lacs County (all by Kennecott Exploration Co., covering a total of 2,540 ha), and four were in the Archean greenstone belts of St. Louis County (all by Lehmann Exploration Management, Inc., covering a total of 450 ha).

Five more metallic minerals leases were issued in 2004 through the negotiated lease process. Two of these (issued to Lehmann Exploration Management, Inc. and covering 146 ha) were in St. Louis County, and the other three (issued to Kennecott Exploration Company and covering 453 ha) were in Kanabec County.

A total of 90 leases (covering a total of 11,500 ha) was terminated in 2004. These included 10 leases (covering 1,270 ha) in Lake County and 80 leases (covering 10,200 ha) in St. Louis County.

Commodity Review

Industrial Minerals

The industrial mineral and construction materials mining industry in Minnesota produced commodities in seven general categories: aggregate, clays, granite, limestone, peat, quartzite, and industrial silica sand. Resources exist for the potential development of additional mine sites for most of these commodities. Minnesota's population continued to grow. At the 2000 census, Minnesota's population was 4,919,000. During the period 1990 to 2000, Minnesota's population grew an average of 54,000 per year. Minnesota was the fastest growing State in the Midwest and the Northeast during that period. The Greater Twin Cities Metropolitan Area, including collar counties, surpassed the 3 million population level in 1998. The Twin Cities area itself is clearly a large market even at the national scale. There are choices for modes of transportation: barge on the Mississippi River to the Gulf of Mexico, ports on the Great Lakes, rail to either coast, and truck via interstate highways to move industrial minerals to various markets. All of these factors created opportunities to develop industrial mineral resources in Minnesota.

Clay and Shale.— Since 1995, four new mines have opened. Clay production in 2004 was derived from seven mines for two general purposes. Kaolin was mined for use in portland cement production and also for making bricks and tiles. Common clay and shale were also mined for bricks and tiles.

Crushed Stone and Sand and Gravel.—Aggregate production in Minnesota was composed of three general categories: sand and gravel mined from glacial deposits or alluvial deposits, crushed dolomite or limestone mined from bedrock in southeastern Minnesota, and crushed rock mined elsewhere from diabase, gabbro, gneiss, granite, quartzite, rhyolite, taconite, or traprock. The materials are used for many construction purposes: asphalt pavement, landscape stone, precast concrete products, railroad ballast, ready mixed concrete, riprap, road base, and other fill material. Some of the same quarries that produce crushed carbonate rocks also produce granular carbonate (limestone or dolomite) rock, which is used for soil amendment or for cement.

Aggregate has been or is currently being mined in all of the State's 87 counties. The USGS conducts an annual survey whereby aggregate producers are requested to respond on a voluntary basis. This survey is the only available tool that portrays the general statewide trends. The survey data for year 2004 are available on the USGS minerals information Web site at URL http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/csmis4q04.pdf.

The following aggregate resource information is available on the DNR Web site at URL http://www.dnr.state.mn.us/lands_minerals/aggregatemaps.html in a PDF file format: aggregate resource maps for 12 counties; the seven-county Minneapolis-St. Paul metropolitan area aggregate resource map with a related report by the Minnesota Geological Survey and the Metropolitan Council on projected availability of aggregate resources; and the final report to the legislature of the Aggregate Resources Task Force from February 1, 2000.

Various types of State-owned stockpile material were sold to local companies for use as construction aggregates, such as road base material. State leases continued to be available from many other stockpiles along the 145 kilometers of the Mesabi Iron Range.

Landscape stone products have become a popular and valuable commodity in the Twin Cities market area. Many dolomite quarries offered landscape stone products. The New Ulm Quartzite Quarry offers purple quartzite landscape stone products. Natural glacial boulders and smaller fieldstone were supplied from many sources from as far away as the Mesabi Iron Range. Cliffs Natural Stone sold a line of landscape stone products obtained from various sources on the eastern Mesabi Iron Range. Cliffs Natural Stone had a State lease for a stockpile of flagstone material near Hoyt Lakes.

The Minnesota Department of Agriculture (MDA) analyzed the granular carbonate soil amendment, commonly called ag-lime, to report the neutralization potential. The analytical data for every ag-lime producer were available on the MDA Web site, www.mda.state.mn.us, by searching for "Ag-lime analysis report." The MDA compilation listed 2004 total sales of 741,000 metric tons (t) of ag-lime, of which 348,000 t (47%) was primary production from Minnesota quarries.

Dimension Stone.—Dimension stone production in Minnesota included three general commodities: granite, limestone, and quartzite. Two granite producers operated nine quarries within the State. The quarries are in the vicinity of Babbitt, Bellingham, Isle, Morton, Ortonville, and St. Cloud. Dimension stone end products generally fall into two categories, building stone and memorials. The building stone products include curbing and paving tile, exterior and interior facing,

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countertops, and furniture. The memorial stone products include crypt fronts, markers, mausoleums, and monuments.

Three limestone producers operated eight quarries within the State. The quarries are located in the vicinity of Mankato and Winona. The limestone was used more commonly for building stone products.

Quartzite was quarried near Jasper in southwestern Minnesota and was used for abrasive products and dimensional products. The abrasive products included grinding media cubes and pebbles. The dimensional products included acid-resistant blocks, building stone, chute and mill liners, and memorials. Cold Spring Granite Company's green stone (Lake Superior Green) was used in the National D-Day Memorial in Bedford, VA, and its black stone (Mesabi Black) significantly increased in popularity. The National Museum of the American Indian, Washington, DC, which opened in September 2004, contains two types of stone from Minnesota—pipestone mined by Travis Erickson and Oneota dolomite provided by Vetter Stone Company under the trade name Kasota-Mankato stone.

Industrial Sand.—Silica sand from sandstone bedrock formations east of the Twin Cities and north of Mankato was used in the petroleum industry, in the construction industry, in foundries, in glassmaking, and for sandblasting.

Peat.—Nine companies held active leases for horticultural peat on State lands. Berger Peat Moss Ltd. obtained permits to develop a new peat mine at the Pine Island Peat Bog in Koochiching County. Michigan Peat Company closed its mine in 2004 on a State lease east of Cromwell.

Metals

Iron Ore.—Minnesota continued to rank first in the Nation in iron ore production, accounting for approximately 75% of the 2004 domestic iron ore shipments to the steel industry. Iron ore pellet production continued to rank among the State's largest industries, contributing more than $1 billion annually to Minnesota's economy.

Iron ore production in Minnesota increased from 36 Mt in 2003 to 41 Mt in 2004. It is estimated that production for 2005 was approximately 42 Mt.

The steel industry has undergone dramatic change, which has resulted in a restructuring of Minnesota's taconite industry. U.S. Steel completed the purchase of National Steel Corp., which included National Steel Pellet Company (now operated by US Steel's Minnesota Ore Operations as Keewatin Taconite). The majority owner in Hibbing Taconite was previously Bethlehem Steel, which was International Steel Group in 2004. Eveleth Taconite Mining Company (EVTAC) ceased operation and filed for Chapter 11 bankruptcy in May 2003. However, in November 2003, Cleveland-Cliffs Inc. and Laiwu Steel Corporation Limited of China obtained the assets of EVTAC, restarted the plant and mine, and began producing pellets during December 2003 as United Taconite Company.

Several improvements and expansions at Minnesota taconite facilities were undertaken. USS Keewatin Taconite constructed a wet scrubber, which resulted in increased pellet production. United Taconite restarted a pellet line that had been idle since 1999. This will increase their United Taconite's pellet production by more than 1 million metric tons per year (Mt/yr). Northshore Mining had plans to restart a pellet line that has been idle for more than 20 years. This would increase Northshore pellet production by more than 1 Mt/yr. USS Minntac was in the planning stages to install a wet scrubber on its line 3 pellet furnace at Mountain Iron, which will result in increased pellet production.

Mesabi Nugget, LLC completed testing of its pilot demonstration plant (PDP) at Silver Bay, MN. The 25,000-metric-ton-per-year (t/yr) PDP was a joint venture between Cleveland Cliffs Inc., Kobe Steel of Japan, Steel Dynamics Inc., and Ferrometrics Inc. The PDP began operation in June 2003 and had several successful campaigns. Several metric tons of pig iron nuggets were shipped to Steel Dynamics in Butler, IN, where they were successfully converted into steel. Planning and permitting were underway for the construction of a 510,000 t/yr iron nugget facility near Hoyt Lakes, MN. Construction of this plant was planned for the beginning of summer 2005.

Environmental Issues and Government Programs

The Environmental Cooperative Research Program addressed environmental and land-use impacts associated with mining. Typical research projects were cosponsored by industry, Federal agencies, or other units of government on a cost-share or in-kind service basis. Projects undertaken in 2004 included the following: characterization and modeling of acid rock drainage, mercury removal from induration offgas by wet scrubbers, a hydrological and water-quality study on the in-pit disposal of taconite tailings, and the development of a hydrological database on mine hydrology. The State of Minnesota's biennial appropriation (July 2003 through June 2005) for mineral cooperative environmental research was $172,000. Matching monies or in-kind contributions are required by the appropriation.

The Iron Ore Cooperative Research Program funded research supporting rapid improvements in iron ore and taconite processing. Research projects funded during the current biennium (July 2003 through June 2005) included dust suppression in iron ore processing plants, an improved pellet fines removal system, magnetically enhanced hydroseparation, greenball characterization, a Mesabi Range GIS workshop, utilization of hemicelluloses and cellulose as a pellet binder, taconite concentrator modeling, oxygen injection in a grate kiln, alternative fuels for traveling grate induration furnaces, accurate in-house ore characterization, iron ore greenball porosity measurements, mercury exchange mechanisms in taconite processing plants, and a tailings water study. The total biennial budget for iron ore cooperative research was $825,000. The State appropriation was $550,000, and the taconite companies' investment was $275,000.

The Minerals Diversification Program funds research supporting the long-term health of the State's mining economy. This is achieved through improvements to the existing industry and by encouraging environmentally sound exploration and development of new mineral resources. Research projects funded during the current biennium (July 2003 through June 2005) included: Bedrock and Quaternary Geology of the

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Mesabi Range, Follow-up Mapping and PGM Evaluation of Mafic Intrusions (excluding Duluth Complex), and Mapping Aggregate Resources in two Minnesota counties. The State biennial appropriation for this program was $344,000.

The Minnesota DNR, DLM, maintains an archive of drill-core and related exploration data at its Hibbing office. Scanned copies of these archives may be accessed through the DNR's Web site at URL http://minarchive.dnr.state.mn.us.

In addition to the "Public Access to Minerals Information" at the DNR's Web site, other information is available on the DNR's Web site at URL http://www.dnr.state.mn.us, including monthly data releases, information on mineral lease availability, aggregate resource maps, a seven-county Minneapolis-St. Paul metropolitan area aggregate resource map and report on projected availability of aggregate resources, and many online documents pertaining to mineral and mining research and exploration.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MINNESOTA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	14	15	20	22	20	22
Gemstones	NA	6	NA	6	NA	6
Iron ore, usable	39,600	1,050,000	34,000	1,030,000	41,400	1,560,000
Lime	W	(3)	W	(3)	W	(3)
Peat	64	5,320	60	5,070	63	5,210
Sand and gravel:						
Construction	43,700	175,000	48,900	212,000	54,900	235,000
Industrial	W	(3)	W	(3)	W	(3)
Stone:						
Crushed	9,960	57,600	9,880	61,800	10,900	68,300
Dimension	22	12,400	16	11,900	22	12,400
Total	XX	1,300,000	XX	1,320,000	XX	1,890,000

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
MINNESOTA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	38	4,550	$21,800	$4.79	27	3,830	$21,200	$5.54	35	4,300	$24,300	$5.66
Granite	4	W	W	6.59	4	W	W	6.09	4	W	W	6.09
Dolomite	8	3,340	22,000	6.59	5	3,540	24,500	6.92	6	3,670	25,100	6.83
Quartzite	1	W	W	6.96	1	W	W	9.23	1	W	W	8.55
Total or average	XX	9,960	57,600	5.78	XX	9,880	61,800	6.25	XX	10,900	68,300	6.27

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.35
Riprap and jetty stone	59	$853	14.46
Filter stone	W	W	4.55
Other coarse aggregates	21	477	22.51
Total or average	95	1,400	14.75
Coarse aggregate, graded:			
Concrete aggregate, coarse	41	222	5.44
Bituminous aggregate, coarse	W	W	9.89
Bituminous surface-treatment aggregate	W	W	12.97
Railroad ballast	W	W	9.10
Other graded coarse aggregates	983	9,140	9.30
Total or average	1,120	10,300	9.19
Fine aggregate (-¾ inch):			
Stone sand, bituminous mix or seal	W	W	7.24
Screening, undesignated	W	W	3.58
Other fine aggregate	133	916	6.91
Total or average	221	1,560	7.05
Coarse and fine aggregates:			
Graded road base or subbase	119	469	3.96
Unpaved road surfacing	W	W	3.96
Crusher run or fill or waste	32	261	8.22
Terrazzo and exposed aggregates	W	W	10.21
Other coarse and fine aggregates	2,340	13,600	5.85
Total or average	2,650	15,100	5.68
Agricultural:			
Limestone	138	823	5.95
Poultry grit and mineral food	(2)	(2)	35.07
Other agricultural uses	4	24	6.00
Total or average	142	847	5.96
Other miscellaneous uses and specified uses not listed	5	9	1.80
Unspecified:[3]			
Reported	3,850	21,400	5.56
Estimated	1,800	11,000	6.25
Total or average	5,650	32,700	5.78
Grand total or average	9,880	61,800	6.25

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.34
Riprap and jetty stone	55	$872	15.85
Filter stone	31	185	5.97
Other coarse aggregates	56	916	16.36
Total or average	142	1,970	13.89
Coarse aggregate, graded:			
Concrete aggregate, coarse	77	386	5.01
Bituminous aggregate, coarse	(2)	(2)	8.72
Bituminous surface-treatment aggregate	(2)	(2)	7.89
Railroad ballast	(2)	(2)	9.28
Other graded coarse aggregates	1,020	8,580	8.41
Total or average	1,380	11,500	8.32
Fine aggregate (-¾ inch):			
Stone sand, concrete	(2)	(2)	4.61
Stone sand, bituminous mix or seal	(2)	(2)	2.48
Screening, undesignated	(2)	(2)	1.54
Other fine aggregates	126	898	7.13
Total or average	241	1,180	4.89
Coarse and fine aggregates:			
Graded road base or subbase	287	1,480	5.15
Unpaved road surfacing	(2)	(2)	3.65
Crusher run or fill or waste	(2)	(2)	8.23
Terrazzo and exposed aggregates	(2)	(2)	14.17
Other coarse and fine aggregates	2,340	14,100	6.06
Total or average	2,790	16,400	5.86
Agricultural:			
Limestone	152	849	5.59
Poultry grit and mineral food	(3)	(3)	43.53
Other agricultural uses	16	344	21.50
Total or average	168	1,190	7.10
Unspecified:[4]			
Reported	4,000	22,200	5.56
Estimated	2,200	14,000	6.39
Total or average	6,180	36,200	5.85
Grand total or average	10,900	68,300	6.27

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	--	--	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	W	W
Coarse and fine aggregates[6]	--	--	--	--	W	W
Agricultural[7]	--	--	--	--	(8)	(8)
Other miscellaneous uses	--	--	--	--	--	--
Unspecified:[9]						
Reported	--	--	1,470	8,890	913	5,210
Estimated	3	17	320	2,000	600	3,700
Total	3	17	1,780	10,900	1,750	11,000

	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	59	1090	W	W
Coarse aggregate, graded[4]	W	W	40	191
Fine aggregate (-⅜ inch)[5]	W	W	W	W
Coarse and fine aggregates[6]	W	W	291	1,110
Agricultural[7]	W	W	W	W
Other miscellaneous uses	--	--	5	9
Unspecified:[9]				
Reported	1,470	7,290	--	--
Estimated	79	490	810	5,100
Total	5,110	33,000	1,240	6,880

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced in District 1.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand bituminous mix or seal, and other fine aggregate.

[6]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	--	--	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	W	W
Coarse and fine aggregates[6]	--	--	--	--	W	W
Agricultural[7]	--	--	--	--	W	W
Unspecified:[8]						
Reported	--	--	1,610	9,770	948	5,310
Estimated	3	17	360	2,300	680	4,300
Total	3	17	1,970	12,000	2,050	13,200

	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	W	W
Coarse aggregate, graded[4]	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W
Coarse and fine aggregates[6]	W	W	W	W
Agricultural[7]	W	W	W	W
Unspecified:[8]				
Reported	1,440	7,140	--	--
Estimated	67	420	1,100	7,000
Total	5,210	33,600	1,670	9,530

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced in District 1.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregate.

[6]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,460	$54,000	$6.39
Plaster and gunite sands	135	1,670	12.34
Concrete products (blocks, bricks, pipe, decorative, etc.)	177	2,090	11.79
Asphaltic concrete aggregates and other bituminous mixtures	4,500	27,500	6.12
Road base and coverings	7,780	25,000	3.22
Road and other stabilization (cement and lime)	418	2,430	5.80
Fill	4,150	8,640	2.08
Snow and ice control	218	997	4.58
Other miscellaneous uses[2]	90	631	6.99
Unspecified:[3]			
Reported	10,800	41,000	3.78
Estimated	12,000	48,000	3.94
Total or average	48,900	212,000	4.33

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown
[2]Includes roofing granules, railroad ballast, and filtration.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,500	$61,200	$6.44
Plaster and gunite sands	103	666	6.43
Concrete products (blocks, bricks, pipe, decorative, etc.)	208	2,010	9.64
Asphaltic concrete aggregates and other bituminous mixtures	4,520	22,300	4.93
Road base and coverings[2]	9,980	29,400	2.95
Fill	4,540	10,900	2.39
Snow and ice control	116	456	3.93
Roofing granules	14	108	7.52
Other miscellaneous uses[3]	62	366	5.85
Unspecified:[4]			
Reported	13,900	58,500	4.21
Estimated	12,000	49,000	4.11
Total or average	54,900	235,000	4.28

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes filtration and railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a

MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	961	5,450	436	2,230	2,130	11,000
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	82	1,210
Asphaltic concrete aggregates and other bituminous mixtures	W	W	143	450	1,830	6,830
Road base and coverings[3]	1,290	3,250	620	2,110	3,070	11,600
Fill	308	743	111	235	1,230	1,940
Snow and ice control	W	W	22	59	36	170
Other miscellaneous uses[4]	605	1,370	38	288	55	307
Unspecified:[5]						
Reported	774	2,320	1,140	3,280	2,060	9,330
Estimated	2,500	9,600	1,500	5,800	3,000	11,000
Total	6,480	22,700	3,980	14,500	13,500	53,800

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	337	1,890	3,490	26,400	533	3,800
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	416	2,740	899	14,100	159	997
Road base and coverings[3]	1,230	3,650	522	2,740	281	1,160
Fill	220	729	2,130	4,550	117	281
Snow and ice control	8	31	W	W	43	147
Other miscellaneous uses[4]	24	181	261	2,610	40	352
Unspecified:[5]						
Reported	259	1,250	716	2,640	39	326
Estimated	1,500	6,300	1,400	6,000	2,200	8,600
Total	3,970	16,800	9,460	59,000	3,370	15,700

	Unspecified district	
	Quantity	Value
Concrete aggregate (including concrete sand)	322	902
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W
Road base and coverings[3]	1,180	2,890
Fill	1	6
Snow and ice control	--	--
Other miscellaneous uses[4]	463	1,040
Unspecified:[5]		
Reported	5,860	21,900
Estimated	--	--
Total	7,820	26,700

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration, roofing granules, and railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b

MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	1,470	8,580	466	1,660	2,410	14,400
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	30	269	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	405	1,420	1,970	8,260
Road base and coverings[3]	1,650	4,000	1,140	3,820	3,840	12,000
Fill	470	1,050	69	269	1,330	3,440
Snow and ice control	W	W	21	80	12	29
Other miscellaneous uses[4]	734	1,830	--	--	140	737
Unspecified:[5]						
Reported	3,580	14,900	971	4,250	4,590	20,100
Estimated	2,100	8,400	3,000	11,000	2,200	9,400
Total	9,960	38,700	6,060	22,800	16,500	68,300

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	463	2,610	3,560	26,900	945	6,560
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	18	111	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	713	5,150	590	4,900	W	W
Road base and coverings[3]	805	2,570	637	3,220	276	1,160
Fill	480	1,540	1,820	3,920	368	643
Snow and ice control	7	24	W	W	33	80
Other miscellaneous uses[4]	12	122	167	1,870	147	956
Unspecified:[5]						
Reported	329	1,390	687	3,290	78	507
Estimated	1,500	6,500	1,500	6,500	1,800	7,700
Total	4,300	20,000	8,960	50,600	3,670	17,600

	Unspecified districts	
	Quantity	Value
Concrete aggregates (including concrete sand)	183	403
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	27	60
Road base and coverings[3]	1,630	2,690
Fill	--	--
Snow and ice control	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	3,640	14,000
Estimated	--	--
Total	5,480	17,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration, railroad ballast, and roofing granules.

[5]Reported and estimated production without a breakdown by end use.

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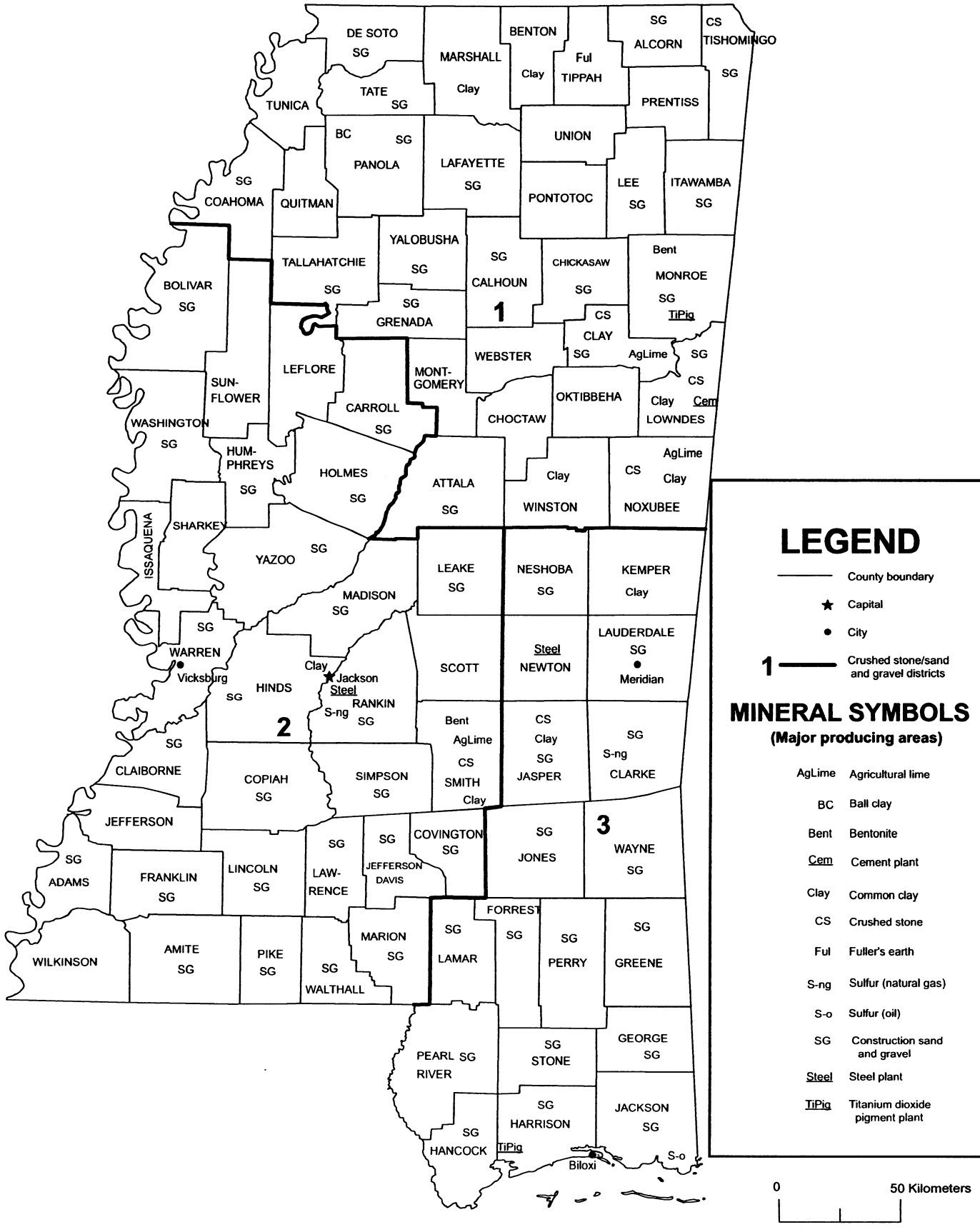
MISSISSIPPI



Source: Mississippi Department of Environmental Quality, Office of Geology/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MISSISSIPPI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Mississippi Department of Environmental Quality, Office of Geology for collecting information on all nonfuel minerals.

In 2004, Mississippi's nonfuel raw mineral production was valued[1] at $194 million, based upon annual U.S. Geological Survey (USGS) data. This was a marginal increase from the State's total nonfuel mineral value for 2003[2], which was up 8.4% from 2002.

Construction sand and gravel was Mississippi's leading nonfuel mineral, accounting for about 42% of the State's total nonfuel mineral value in 2004. When combined with the value of crushed stone, the States's two major mined construction materials accounted for nearly 60% of Mississippi's total value. In descending order of value, construction sand and gravel was followed by fuller's earth, crushed stone, portland cement, bentonite, and ball clay. In 2004, increases in the values of bentonite, portland cement, and ball clay (descending order of change) more than offset decreases in fuller's earth, down $7.5 million, construction sand and gravel, down $1.9 million, and industrial sand and gravel, resulting in a net increase in total nonfuel mineral production value for the State (table 1).

In 2003, increases in the production of fuller's earth, construction sand and gravel, and crushed stone, values up nearly $13 million, $9.3 million, and $6 million, respectively, led the way in Mississippi's rise in total value. Smaller yet significant increases took place in the values of portland cement and ball clay. With significant decreases in production, the largest decreases in value took place in industrial sand and gravel and bentonite (table 1).

In 2004, Mississippi rose to second from fourth in the quantities of bentonite produced and to third from fourth in ball clay, but decreased to third from second in fuller's earth. The State continued to be a significant producer of construction sand and gravel and common clays. Metals that were produced in Mississippi, especially raw steel, were processed from materials received from other domestic and foreign sources.

The following narrative information was provided by the Mississippi Department of Environmental Quality's (DEQ) Office of Geology[3] (MOG). The Mississippi Environmental Quality Permit Board of the State's Commission on Environmental Quality (CEQ) issued 60 surface mining permits covering approximately 571 hectares (ha) and processed 112 Notices of Exempt Operations [1.6 ha (4 acres) or less] covering approximately 181 ha. The MOG Mining and Reclamation Division (MRD) performed 827 annual inspections for all active mining permits on file and received applications for bond release on 90 permits. During the year, 134 ha were reclaimed and released.

All mines in Mississippi were surface industrial mineral operations except one, the State's only coal mine. Mississippi Lignite Mining Company in Choctaw County, continued to mine and stockpile lignite, producing approximately 3.1 million metric tons per year (3.4 million short tons) of lignite from the Wilcox Group formation. The brownish black coal material is mined for feed to the 440-megawatt Red Hills "mine-mouth" powerplant that uses state-of-the-art technology to produce electricity that is sold to the Tennessee Valley Authority.

Legislation and Government Activities

The CEQ approved the amended State Surface Mining Rules and Regulations in 2004 following revisions made to the State's Mining and Reclamation Law (the State's noncoal surface mining law of 1978) by the Mississippi State Legislature in 2002. The new regulations closely follow the new law; among the changes that the mining industry will be seeing as a result of these new regulations are the maintaining of buffer zones between mining and permit boundaries. This had been a problem in the past because mining could take place up to the permit boundary, resulting in abrupt property ownership changes within a formation that was being continuously mined. This practice had prevented the operator sloping down the highwall from the top or caving of material from an adjacent property owner.

The MRD continued to perform safety training for miners of nonfuel mineral operations in the State in compliance with regulations (Parts 46 and 48) of the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). Two MRD staff members were certified by MSHA to do mine safety training. A grant from MSHA helped MRD provide training for mining operations that process material, such as rock crushing or washing operations. Approximately 600 people were trained in 2004.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Kenneth McCarley, Geologist and Director, Mining and Reclamation Division, Mississippi Office of Geology, authored the text of the State mineral industry information provided by that agency.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSISSIPPI[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Clays:						
Common	496	2,210	524	2,050	610	2,700
Fuller's earth	411	29,900	534	42,700	381	35,200
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	13,600	73,200	14,600	82,600	14,100	80,700
Stone, crushed	2,620	27,900	2,850	33,900	2,760	34,200
Combined values of cement (portland), clays (ball, bentonite), sand and gravel (industrial)	XX	44,600	XX	31,400	XX	41,500
Total	XX	178,000	XX	193,000	XX	194,000

NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MISSISSIPPI: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	3	2,620	$27,900	$10.64	3	2,850	$33,900	$11.90	3	2,760	$34,200	$12.40

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3a
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), other coarse aggregates	W	W	$21.60
Coarse aggregate, graded, other graded coarse aggregates	W	W	16.81
Fine aggregate (-⅜ inch), other fine aggregates	W	W	15.96
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	7.59
Other coarse and fine aggregates	(2)	(2)	15.68
Total or average	356	$5,570	15.65
Agricultural limestone	W	W	7.83
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	9.48
Sulfur oxide removal	(2)	(2)	7.59
Total or average	868	8,050	9.27
Special, mine dusting or acid water treatment	W	W	7.59
Unspecified:[3]			
Reported	876	8,300	9.48
Estimated	120	1,600	13.15
Total or average	996	9,880	9.92
Grand total or average	2,850	33,900	11.90

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), other coarse aggregates	W	W	$21.66
Coarse aggregate, graded, other graded coarse aggregates	W	W	17.49
Fine aggregate (-⅜ inch), other fine aggregates	W	W	15.69
Coarse and fine aggregates, other coarse and fine aggregates	W	W	15.83
Agricultural limestone	W	W	9.90
Chemical and metallurgical:			
Cement manufacture	W	W	9.47
Sulfur oxide removal	W	W	7.99
Unspecified:[3]			
Reported	706	6,690	9.48
Estimated	18	160	9.00
Total or average	724	6,850	9.47
Grand total or average	2,760	34,200	12.40

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[3]Reported and estimated production without a breakdown by end use.

TABLE 4a
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	W	W	--	--	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Special[8]	W	W	--	--	--	--
Unspecified:[9]						
Reported	401	3,800	475	4,500	--	--
Estimated	120	1,600	--	--	--	--
Total	1,620	16,300	616	7,300	619	10,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes other coarse aggregates.
[3]Includes other graded coarse aggregates.
[4]Includes other fine aggregates.
[5]Includes graded road base or subbase and other coarse and fine aggregates.
[6]Includes agricultural limestone.
[7]Includes cement manufacture and sulfur oxide removal.
[8]Includes mine dusting or acid water treatment.
[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	W	W	--	--	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Unspecified:[8]						
Reported	323	3,060	383	3,630	--	--
Estimated	18	160	--	--	--	--
Total	1,520	15,300	528	6,510	708	12,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes other coarse aggregates.
[3]Includes other graded coarse aggregates.
[4]Includes other fine aggregates.
[5]Includes other coarse and fine aggregates.
[6]Includes agricultural limestone.
[7]Includes cement manufacture and sulfur oxide removal.
[8]Reported and estimated production without a breakdown by end use.

TABLE 5a
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,200	$23,600	$5.63
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	114	779	6.83
Asphaltic concrete aggregates and other bituminous mixtures	2,530	18,100	7.15
Road base and coverings	888	3,660	4.12
Fill	253	533	2.11
Other miscellaneous uses	125	743	5.95
Unspecified:[3]			
Reported	2,590	13,900	5.37
Estimated	3,900	21,000	5.39
Total or average	14,600	82,600	5.66

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 5b
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	2,360	$13,200	$5.59
Asphaltic concrete aggregates and other bituminous mixtures	1,160	8,290	7.13
Road base and coverings	679	2,750	4.05
Fill	185	429	2.31
Other miscellaneous uses	3	87	27.56
Unspecified:[3]			
Reported	4,990	26,900	5.39
Estimated	4,700	29,000	6.16
Total or average	14,100	80,700	5.73

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6a
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	2,200	11,700	1,360	9,220	749	3,500
Asphaltic concrete aggregates and other bituminous mixtures	1,210	9,290	W	W	W	W
Road base and coverings	609	2,550	W	W	W	W
Fill	99	276	4	10	149	246
Other miscellaneous uses	--	--	1,200	7,730	525	2,910
Unspecified:[3]						
Reported	1,530	7,170	668	4,640	396	2,120
Estimated	570	3,000	2,700	15,000	350	1,700
Total	6,220	33,900	5,950	36,700	2,170	10,500

	Unspecified districts	
Use	Quantity	Value
Concrete aggregate and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings	--	--
Fill	--	--
Other miscellaneous uses	--	--
Unspecified:[3]	--	--
Reported	--	--
Estimated	310	1,500
Total	310	1,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6b

MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	456	2,220	1,150	7,600	608	2,560
Asphaltic concrete aggregates and road base materials	481	2,340	989	6,220	176	1,240
Fill	98	261	4	6	53	97
Other miscellaneous uses	--	--	--	--	3	87
Unspecified:[3]						
Reported	4,060	21,300	756	4,690	171	924
Estimated	990	7,800	2,600	15,000	1,100	5,900
Total	6,090	33,900	5,540	33,900	2,110	10,800

Use	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]	141	794
Asphaltic concrete aggregates and road base materials	196	1,240
Fill	31	65
Other miscellaneous uses	--	--
Unspecified:[3]		
Reported	--	--
Estimated	--	--
Total	368	2,100

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Reported and estimated production without a breakdown by end use.

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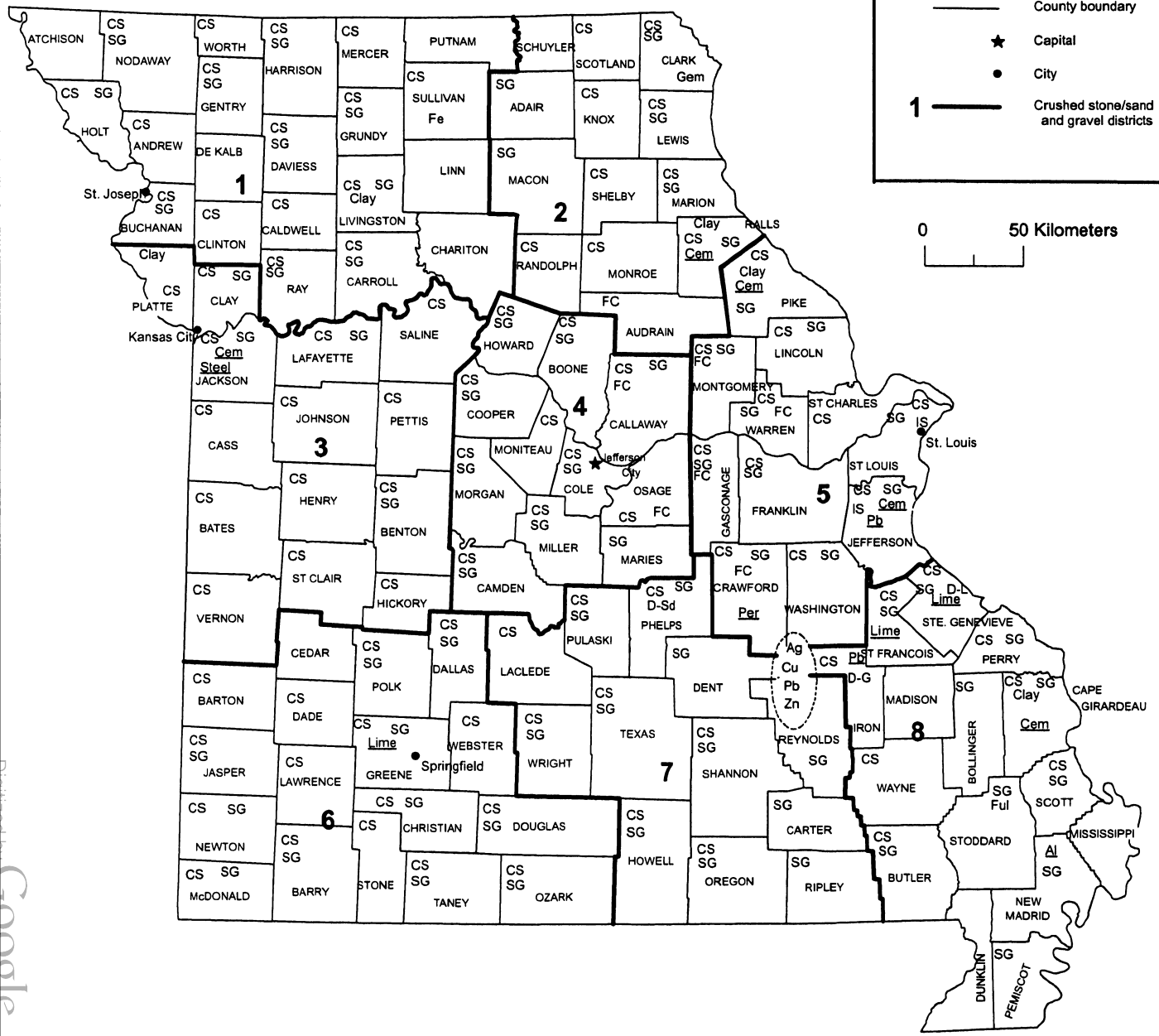
MISSOURI



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS

(Major producing areas)

Ag	Silver
Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
FC	Fire clay
Ful	Fuller's earth
Gem	Gemstones
IS	Industrial sand
Lime	Lime plant
Pb	Lead
Pb	Lead plant
Per	Perlite plant
SG	Construction sand and gravel
Zn	Zinc
⬭	Concentration of mineral operations

Source: Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MISSOURI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division, for collecting information on all nonfuel minerals.

In 2004, Missouri's nonfuel raw mineral production was valued[1] at $1.47 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 9.7% increase from that of 2003[2] and followed a 6.3% increase from 2002 to 2003. The State was 10th in rank (9th in 2003) among the 50 States in total nonfuel mineral production value, of which Missouri accounted for about 3.2% of the U.S. total.

Crushed stone, cement (portland and masonry), lead, and lime, in descending order of value, accounted for more than 87% of Missouri's total nonfuel mineral production value in 2004. Missouri continued to be the top lead-producing State in the Nation, producing significantly more than one-half of the Nation's output. But crushed stone and portland cement, by value, remained the State's leading nonfuel minerals in 2004, having surpassed lead in 1997 and 1999, respectively. Prior to 1997, lead had been Missouri's leading nonfuel mineral since 1969, except for several years in the mid-1980s and during 1993-95, when crushed stone was ranked first.

In 2004, even though there was a small drop in lead production, the value of lead was up more than $45 million, the largest increase in value of all the State's nonfuel raw minerals. Following lead, but with each having increases in production, were portland cement, value up $36 million, lime, up nearly $22 million, construction sand and gravel and copper, up about $10 million each, and masonry cement and silver, up about $5 million each. The most significant decrease was that of crushed stone, the value of which was down $11 million; fire clays and fuller's earth values also decreased, down more than $1 million each (table 1).

In 2003, although there was a 2.3% drop in crushed stone production, the value of crushed stone was up more than $50 million, the largest increase in value of all the State's nonfuel raw minerals. Following crushed stone, each with increases in production, were portland cement, value up $19 million, lime, up nearly $12 million, construction sand and gravel, up about $7 million, copper and fuller's earth, up more than $5 million and more than $2 million, respectively. The most significant decreases were those of the production and values of lead and zinc with respective decreases in value of about $8 million and more than $4 million. All other changes were significantly smaller (table 1).

In 2004, Missouri continued to be first in the quantities of lead and lime produced, first of three fire clay-producing States, second in zinc, fifth in cement (portland and masonry combined), and sixth in the production of silver. The State rose to 2d from 3d in the production of fuller's earth, but decreased to 6th from 4th in copper, to 9th from 6th in crushed stone, and to 12th from 10th in common clays. Additionally, Missouri was a significant producer of construction sand and gravel, industrial sand and gravel, and gemstones (gemstones based upon value).

The Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division[3] (GSRAD), provided the following narrative information. Some data or information as reported by the GSRAD may differ from USGS preliminary estimates and production figures.

Commodity Review

Industrial Minerals

Cement.—Cement production in 2004 was about 5.3 million metric tons (Mt). This was about a 0.7% increase from that of 2003. Portland cement accounted for more than 97% of the total. The remainder was masonry cement. The overall unit value of cement increased about 13% from that of 2003. Production continued to be from five cement plants. Continental Cement Co. LLC operated the Hannibal plant; Holcim (US) Inc. operated the Clarksville plant; Buzzi Unicem USA Inc. operated the Selma plant and the Cape Girardeau plant; and Lafarge North America Inc. operated the Sugar Creek plant. The first two were along the Mississippi River north of St. Louis; the second two were along the Mississippi River south of St. Louis; and the fifth was along the Missouri River just east of Kansas City. Portland cement was produced by all five plants. Masonry cement was produced only at the Cape Girardeau plant. Cement accounted for about 26.8% of the total value of nonfuel mineral production.

Holcim continued the permitting process for its proposed Lee Island cement production facility along the Mississippi River in extreme northern Ste. Genevieve County, between the Selma and Cape Girardeau plants.

Clays.—Clay production was about 1.8 Mt in 2004. This was about an 8.6% increase from that of 2003. Three types of clay were produced: common, fire, and fuller's earth (also called absorbent clay). The overall unit value of clay decreased about 9.6% from that of 2003. Clay accounted for about 2.5% of the total value of nonfuel mineral production.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Patrick S. Mulvany, Geologist and Chief, Geologic Data Acquisition and Management Section, authored the text of the State mineral industry information provided by the Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division.

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About 1.06 Mt of common clay in the form of shale and claystone was mined from 10 pits by 7 companies in Cape Girardeau, Livingston, Pike, Platte, and Ralls Counties. The majority of it was used in the manufacture of portland cement. The remainder was used in the manufacture of bricks and flowerpots.

About 351,000 metric tons (t) of fire clay was mined from 15 pits by three companies at various locations in the northern and southern fire clay districts of east-central Missouri.

Fuller's earth was mined by Nestle Purina Petcare Co. from Paleocene Porters Creek Clay in Stoddard County and was used to make absorbent pet litter.

Construction Sand and Gravel.—Construction sand and gravel production was about 12 Mt in 2004. This was about a 13% increase from that of 2003. Unit value increased by about 2% from that of 2003. Production was from 92 pits operated by 69 companies in 50 counties. Construction sand and gravel accounted for about 3.7% of the total value of nonfuel mineral production. In previous years, annual production ranged from 10 Mt to 11 Mt.

Crushed Stone.— In 2004, crushed stone production was about 77.0 Mt, which was about a 6.7% increase from that of 2003. Please note that Missouri State numbers are somewhat different from the USGS numbers shown in table 1. Production was from about 189 quarries scattered across the State that were operated by 92 companies. Crushed stone included four rock types: limestone, dolomite, granite (more accurately rhyolite porphyry), and trap rock (more accurately dark rhyolite porphyry or dark trachyte porphyry or both). Crushed stone accounted for about 30.8% of the total value of nonfuel mineral production.

Crushed limestone and dolomite production was about 75.3 Mt. This was about a 6.3% increase from that of 2003. Production was from about 185 quarries located across the State. Crushed limestone and dolomite accounted for about 26.5% of the total value of nonfuel mineral production.

Crushed granite and trap rock production was about 1.7 Mt. This was about a 4.0% increase from that of 2003. Production was from four quarries operated by four companies in the St. Francois Mountains region of southeastern Missouri. Crushed granite and trap rock accounted for about 4.0% of the total value of nonfuel mineral production.

Dimension Stone.—Missouri Red Quarries, Inc. continued to produce dimension granite from the Graniteville Quarry in Iron County. Dimension stone accounted for about 0.05% of the total value of nonfuel mineral production.

Gemstones.—As in previous years, quartz geodes were dug from Mississippian Warsaw Formation in extreme northeastern Missouri by one business concern. Others were collected and sold by hobbyists. Geodes accounted for about 0.01% of the total value of nonfuel mineral production.

Industrial (Silica) Sand.—High-purity quartz (silica) sand production for 2004 was about 609,000 t. This was about a 3.9% increase more than that of 2003. The sand was mined from the Ordovician St. Peter Sandstone in St. Louis and Jefferson Counties by Unimin Corp. and U.S. Silica Co. Unit price remained about the same. Industrial (silica) sand accounted for about 0.8% of the total value of nonfuel mineral production.

Lime.—In 2004, lime production was about 2.6 Mt. This was about a 6.4% increase more than that of 2003. Two types of lime were produced: quick and hydrated. Production was from four plants. In 2004, Vessell Mineral Products Co. restarted its small lime plant at Bonne Terre in St. Francois County, although data were not available on its production. The Chemical Lime Co. and the Mississippi Lime Co. operated their respective Ste. Genevieve plants near the Mississippi River in southeastern Missouri. The Mississippi Lime Co. continued to operate its Springfield plant in southwestern Missouri, but there were indications that the plant may shut down in 2005. Lime accounted for about 11.4% of the total value of nonfuel mineral production.

Metals

Copper, Lead, Silver, and Zinc.—Since approximately 1997, all production of metals in Missouri came from The Doe Run Company's underground mines in the Viburnum Trend on the west side of the St. Francois Mountains in southeastern Missouri. Metals production in 2004 comprised about 246,000 t lead, 50,000 t zinc, 4,200 t copper, and 59,000 kg silver. Prices of all four metals increased significantly during 2004. Metals accounted for about 24% of the total value of nonfuel mineral production.

Doe Run's Viburnum No. 28 Mine was in the process of closing. The Herculaneum smelter, located 40 kilometers south of St. Louis, continued to operate, and the Glover smelter located in Annapolis, MO, remained on care-and-maintenance status.

Government Programs

In late 2003, the GSRAD produced a CD-ROM titled "Missouri Environmental Geology Atlas (MEGA)" that is a compilation of Geographic Information System data layers, including alluvial flood plains, bedrock geology, dye trace data, geologic structures, public land survey system information, sinkhole locations, and well and spring locations. Also included are data layers for streams, lakes, major roads, urban areas, and county boundaries.

In early 2004, the GSRAD released the 2003 Sesquicentennial editions of the Geologic Map of Missouri and the Mineral Resources and Industry Map of Missouri. They are color wall maps at the scale of 1:500,000.

During 2004, the GSRAD continued to add new information into the Inventory of Mines, Occurrences and Prospects (IMOP) database that contained about 20,000 records at yearend.

On July 1, 2004, the GSRAD received a grant from the USGS to complete the Missouri portion of the National Geochemical Survey. The goal of the 2-year project was to collect more than 500 stream-sediment and soil samples on a predetermined sampling grid that covered about 13 million hectares, including all of the State north of the 38th parallel and about three-eighths of the State south of the 38th parallel.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSOURI[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	4,820	333,000 e	5,180	352,000 e	5,260	388,000 e
Clays:						
Common	1,050	3,930	970	3,660	911	3,290
Fire	340	7,360	307	7,230	W	W
Sand and gravel:						
Construction	10,000	42,300	10,600	49,400	12,200	60,000
Industrial	W	W	586	12,800	589	14,200
Stone, crushed	73,200 r	376,000 r	71,500	426,000	69,100	415,000
Combined values of cement (masonry), clays (fuller's earth), copper, gemstones (natural), lead, lime, silver, stone (dimension granite), zinc, and values indicated by symbol W	XX	494,000	XX	488,000	XX	593,000
Total	XX	1,260,000	XX	1,340,000	XX	1,470,000

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MISSOURI: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	164 r	68,200 r	$346,000 r	$5.08	172	66,100	$346,000	$5.24	162	64,200	$336,000	$5.23
Dolomite	21 r	3,490 r	18,000 r	5.15 r	22	3,780	20,700	5.48	18	3,060	16,800	5.49
Granite	2	W	W	7.54	2	W	W	42.97	2	W	W	48.10
Traprock	2	W	W	7.81	2	W	W	8.83	2	W	W	9.86
Sandstone	--	--	--	--	--	--	--	--	1	W	W	3.61
Total or average	XX	73,200 r	376,000 r	5.14	XX	71,500	426,000	5.96	XX	69,100	415,000	6.02

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.48
Riprap and jetty stone	3,570	$12,300	3.45
Filter stone	109	584	5.36
Other coarse aggregates	1,580	9,390	5.93
Total or average	5,260	22,300	4.23
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,390	14,200	5.92
Bituminous aggregate, coarse	1,240	8,030	6.46
Bituminous surface-treatment aggregate	201	1,360	6.76
Railroad ballast	856	4,270	4.99
Other graded coarse aggregates	5,010	30,000	5.99
Total or average	9,710	57,800	5.96
Fine aggregate (-¾ inch):			
Stone sand, concrete	187	1,430	7.65
Stone sand, bituminous mix or seal	365	2,650	7.26
Screening, undesignated	437	1,520	3.49
Other fine aggregates	1,880	10,500	5.60
Total or average	2,870	16,100	5.62
Coarse and fine aggregates:			
Graded road base or subbase	4,990	20,700	4.15
Unpaved road surfacing	856	4,990	5.83
Terrazzo and exposed aggregate	(2)	(2)	11.57
Crusher run or fill or waste	646	5,210	8.06
Roofing granules	543	53,000	97.53
Other coarse and fine aggregates	4,140	20,700	5.00
Total or average	11,200	105,000	9.36
Other construction materials[3]	85	584	6.87
Agricultural, limestone	843	3,520	4.17
Chemical and metallurgical:			
Cement manufacture	4,240	14,000	3.29
Lime manufacture	1,770	7,090	4.01
Flux stone	(4)	(4)	5.79
Total or average	6,010	21,000	3.50
Special, asphalt fillers or extenders	(5)	(5)	6.50
Other miscellaneous uses and specified uses not listed	266	1,450	5.44
Unspecified:[6]			
Reported	14,400	74,200	5.17
Estimated	21,000	120,000	5.96
Total or average	35,300	199,000	5.64
Grand total or average	71,500	426,000	5.96

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3]Includes pipe bedding.

[4]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[5]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	448	$3,070	$6.85
Riprap and jetty stone	206	1,320	6.42
Filter stone	150	1,010	6.70
Other coarse aggregates	1,390	8,030	5.78
Total or average	2,190	13,400	6.12
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,560	11,300	7.24
Bituminous aggregate, coarse	563	3,300	5.87
Bituminous surface-treatment aggregate	184	1,130	6.16
Railroad ballast	W	W	6.80
Other graded coarse aggregates	5,430	34,200	6.30
Total or average	7,730	49,900	6.45
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	6.72
Stone sand, bituminous mix or seal	95	620	6.53
Screening, undesignated	600	2,470	4.11
Other fine aggregates	1,780	10,500	5.92
Total or average	2,470	13,600	5.50
Coarse and fine aggregates:			
Graded road base or subbase	2,880	16,000	5.55
Unpaved road surfacing	771	4,480	5.81
Crusher run or fill or waste	70	366	5.23
Roofing granules	(3)	(3)	99.06
Other coarse and fine aggregates	5,890	81,800	13.90
Total or average	9,610	103,000	10.68
Other construction materials	60	393	6.55
Agricultural, limestone	(4)	(4)	4.71
Chemical and metallurgical:			
Cement manufacture	6,000	23,600	3.93
Lime manufacture	(4)	(4)	6.54
Special, asphalt fillers or extenders	(4)	(4)	5.02
Other miscellaneous uses and specified uses not listed	12	107	8.92
Unspecified:[5]			
Reported	20,600	96,200	4.67
Estimated	20,000	112,000	5.69
Total or average	40,300	209,000	5.17
Grand total or average	69,100	415,000	6.02

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	55	290	W	W	55	278	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	--	--
Coarse and fine aggregates[5]	317	1,880	W	W	290	1,410	W	W
Other construction materials[6]	--	--	--	--	--	--	--	--
Agricultural[7]	42	191	W	W	W	W	28	72
Chemical and metallurgical[8]	--	--	--	--	W	W	--	--
Special[9]	--	--	--	--	--	--	--	--
Other miscellaneous uses	204	1,120	--	--	--	--	--	--
Unspecified:[11]								
Reported	2,580	14,100	209	1,050	4,280	21,700	442	2,630
Estimated	560	3,300	3,100	18,000	5,600	33,000	1,800	11,000
Total	3,820	21,400	3,630	21,200	11,100	61,700	3,850	22,300

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	1,020	6,020	W	W	W	W	W	W
Coarse aggregate, graded[3]	3,320	19,700	1,470	10,800	W	W	3,000	15,800
Fine aggregate (-⅜ inch)[4]	W	W	511	3,200	W	W	628	3,940
Coarse and fine aggregates[5]	2,820	14,200	1,550	8,740	W	W	5,320	74,300
Other construction materials[6]	39	241	32	259	14	85	--	--
Agricultural[7]	W	W	151	848	W	W	W	W
Chemical and metallurgical[8]	W	W	W	W	--	--	W	W
Special[9]	--	--	--	--	--	--	(10)	(10)
Other miscellaneous uses	20	108	--	--	--	--	42	217
Unspecified:[11]								
Reported	4,280	21,500	1,960	10,200	--	--	594	2,970
Estimated	3,600	22,000	2,700	16,000	1,100	6,600	2,400	14,000
Total	19,600	98,600	8,800	53,200	1,870	10,800	18,800	137,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes pipe bedding.

[7]Includes agricultural limestone.

[8]Includes cement manufacture, flux stone, and lime manufacture.

[9]Includes asphalt fillers or extenders.

[10]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[11]Reported and estimated production without a breakdown by end use.

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TABLE 4b

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	179	1,200	W	W	W	W
Coarse aggregate, graded[3]	--	--	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	--	--	W	W	W	W	--	--
Coarse and fine aggregates[5]	W	W	W	W	767	4,550	924	4,310
Other construction materials	--	--	--	--	--	--	--	--
Agricultural[6]	W	W	115	568	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W	--	--
Special[8]	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--
Unspecified:[9]								
Reported	2,130	11,500	167	836	5,180	28,300	269	1,600
Estimated	1,000	6,300	2,300	13,000	2,100	12,000	1,900	11,000
Total	3,190	18,100	4,270	24,800	8,830	49,200	4,420	25,400

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	1,360	8,450	W	W	W	W	W	W
Coarse aggregate, graded[3]	3,480	21,200	1,240	9,370	W	W	1,490	9,680
Fine aggregate (-⅜ inch)[4]	1,400	7,060	739	4,940	W	W	W	W
Coarse and fine aggregates[5]	3,900	19,900	W	W	W	W	1,820	60,600
Other construction materials	3	15	57	378	--	--	--	--
Agricultural[6]	80	289	161	874	W	W	--	--
Chemical and metallurgical[7]	3,050	8,090	W	W	--	--	W	W
Special[8]	--	--	--	--	--	--	W	W
Other miscellaneous uses	--	--	--	--	3	19	9	88
Unspecified:[9]								
Reported	2,520	12,700	1,410	7,720	--	--	8,910	33,600
Estimated	3,700	20,000	5,200	31,000	1,000	5,800	2,600	12,000
Total	19,500	98,000	10,200	62,700	1,970	11,200	16,800	126,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement and lime manufacture.

[8]Includes asphalt fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,580	$26,200	$4.69
Plaster and gunite sands	144	702	4.88
Concrete products (blocks, bricks, pipe, decorative, etc.)	433	2,180	5.03
Asphaltic concrete aggregates and other bituminous mixtures	466	1,850	3.97
Road base and coverings	300	1,680	5.59
Fill	296	945	3.19
Other miscellaneous uses[2]	205	1,280	6.24
Unspecified:[3]			
Reported	259	1,730	6.68
Estimated	2,900	13,000	4.41
Total or average	10,600	49,400	4.66

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast, roofing granules, and snow and ice control.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,070	$30,600	$5.04
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	1,160	6,100	5.26
Asphaltic concrete aggregates and other bituminous mixtures	648	2,880	4.44
Road base and coverings	124	547	4.40
Fill	153	656	4.30
Snow and ice control	52	236	4.56
Other miscellaneous uses[3]	93	816	8.75
Unspecified:[4]			
Reported	782	4,180	5.34
Estimated	3,100	14,000	4.47
Total or average	12,200	60,000	4.91

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a

MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Districts 4 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	104	469	--	--	5,260	24,700
Asphaltic concrete aggregates and road base materials	W	W	--	--	616	2,880
Fill	W	W	--	--	W	W
Other miscellaneous uses[4]	33	136	--	--	360	1,590
Unspecified:[5]						
Reported	4	19	--	--	179	1,320
Estimated	570	2,400	390	1,800	1,400	6,200
Total	708	3,070	389	1,780	7,860	36,700

Use	Districts 6 and 7		District 8	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	171	998	619	2,840
Asphaltic concrete aggregates and road base materials	78	298	W	W
Fill	40	180	W	W
Other miscellaneous uses[4]	11	77	127	594
Unspecified:[5]				
Reported	52	262	25	135
Estimated	450	2,100	82	350
Total	797	3,900	856	3,920

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2, 4 and 5, and 6 and 7 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes railroad ballast, roofing granules, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

TABLE 6b

MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Districts 4 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	W	W	--	--	5,320	27,100
Asphaltic concrete aggregates and road base materials	W	W	--	--	137	696
Fill	22	78	--	--	117	527
Other miscellaneous uses[4]	734	3,900	--	--	78	716
Unspecified:[5]						
Reported	29	246	(6)	2	288	1,700
Estimated	520	2,300	360	1,600	1,800	7,700
Total	1,310	6,530	360	1,620	7,700	38,500

Use	Districts 6 and 7		District 8		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	156	913	718	3,310	W	W
Asphaltic concrete aggregates and road base materials	35	219	W	W	417	1,660
Fill	13	49	(6)	2	--	--
Other miscellaneous uses[4]	39	198	99	487	417	2,010
Unspecified:[5]						
Reported	87	459	--	--	376	1,770
Estimated	460	2,200	40	180	--	--
Total	793	4,010	857	3,970	1,210	5,440

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2, 4 and 5, and 6 and 7 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes roofing granules and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

[6]Less than ½ unit.

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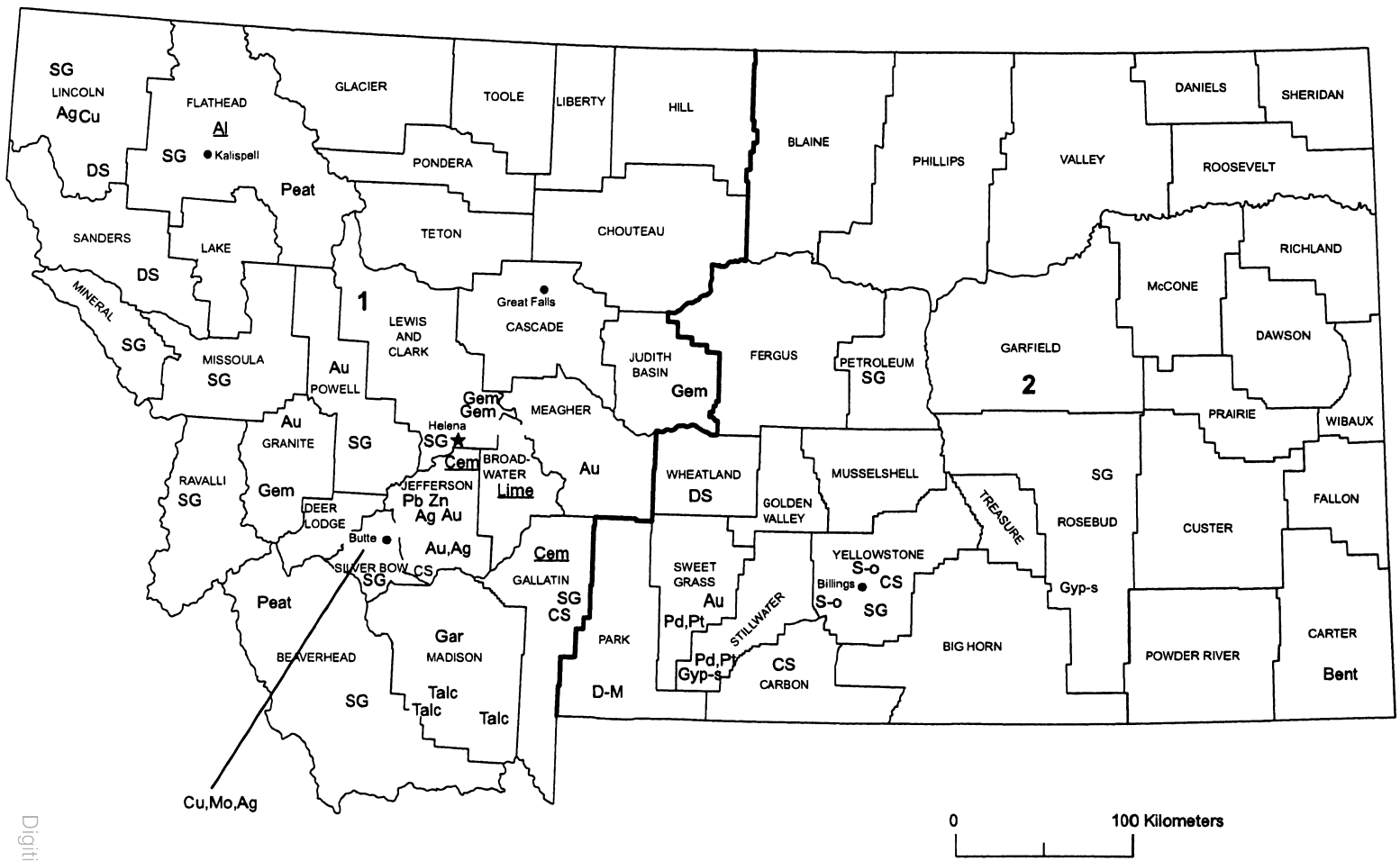
MONTANA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Al	Aluminum plant
Au	Gold
Bent	Bentonite
Cem	Cement plant
CS	Crushed stone
Cu	Copper
D-M	Dimension marble
DS	Dimension stone
Gar	Garnet
Gem	Gemstones
Gyp-s	Synthetic gypsum
Lime	Lime plant
Mo	Molybdenum
Pb	Lead
Pd	Palladium
Peat	Peat
Pt	Platinum
S-o	Sulfur (oil)
SG	Construction sand and gravel
Talc	Talc
Zn	Zinc

Source: Montana Bureau of Mines and Geology/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF MONTANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Montana Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 2004, Montana's nonfuel raw mineral production was valued[1] at $624 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of more than 26% compared with that of 2003[2] and followed an increase of nearly 5% from 2002 to 2003. The State rose in rank to 26th from 28th among the 50 States in nonfuel raw mineral production value and accounted for about 1.4% of the U.S. total.

Overall, metallic minerals accounted for nearly 71% of Montana's total nonfuel mineral production value in 2004. Platinum and palladium were, by value, the State's leading nonfuel minerals followed by copper, molybdenum concentrates, construction sand and gravel, and portland cement, the combined total of which accounted for nearly 80% of the State's total nonfuel mineral value.

In 2004, a significant majority of Montana's nonfuel minerals increased in value. Copper and molybdenum concentrates were up by more than $80 million each as a result of substantial production increases and significantly higher average copper prices and significantly higher average molybdenum concentrate prices. The recent upward trend in molybdenum prices began in December 2002 and continued throughout 2003 and 2004. For example, the average annual price of molybdic oxide rose from $8.27 per kilogram in 2002 to $11.75 per kilogram in 2003 to $36.73 per kilogram in 2004 and reached $68.89 in December 2004. Molybdenum concentrate prices remained high and continued to increase more gradually during the early months of 2005. (Prices were reported in Platts Metals Week in dollars per pound of contained molybdenum.)

In 2004, platinum and palladium, values were up nearly $17 million and $11 million, respectively. Other commodities with significant increases in value were those of silver, portland cement, construction sand and gravel, crushed stone, all up by more than $5 million each, and zinc, up by more than $3 million. These increased nonfuel mineral values together far outweighed the substantial decrease in gold production and value, which was down more than $90 million; bentonite production also decreased, its value down about $6.5 million (table 1).

In 2003, the production and value of gold significantly increased from that of 2002 with the commodity's value up more than $60 million. Although production was down slightly, the value of platinum increased by nearly $17 million. Smaller increases took place in zinc, lead, talc, crushed stone, and silver, ranging from $5 million rise in zinc progressively down to a $2 million increase in silver. These increases more than compensated for a substantial drop in the value of palladium. In addition to a more than 5% decrease in production, the precious metal's mineral production value decreased more than 40%, down nearly $71 million from that of 2003, owing to the palladium's significantly lower average price for the year. Smaller decreases in value took place in portland cement and construction sand and gravel, down about $3 million and $2 million, respectively. Although the value was small in comparison to most of the State's other nonfuel minerals, the rise in the value of gemstones was significant, representing a nearly 67% increase in the commodity's value (table 1).

In 2004, Montana continued to be the only State to have primary palladium and platinum mine production. It also continued to be first in the quantity of talc produced, fourth in zinc, sixth in gemstones, and it remained a significant producer of construction sand and gravel. While the State rose in rank to fourth from fifth in copper, to fifth from sixth in molybdenum concentrates, and to fifth from seventh in the production of silver, it decreased to third from second in bentonite, to fifth from fourth in lead, and to eighth from fourth in gold.

The Montana Bureau of Mines and Geology[3] (MBMG) provided the narrative information that follows. Production and other data in the following text are those reported by the MBMG, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS.

In 2004, the Montana mining industry responded positively to an atmosphere of rising commodity prices, including some commodities that had not seen significant price increases since the 1940s. Interest focused on copper, gold, iron, molybdenum, and silver, with a cautious look at tungsten.

Operating mines struggled to secure equipment and tires. Because of the extended duration of the last metals price slump, many operations had deferred replacing their trucks and loaders for nearly a decade. Companies placing orders found that some delivery dates were projected 1 to 2 years and even longer for very large pieces of equipment. Late in the year, some companies indicated that tires were difficult to secure, and there were no plans by the tire companies to increase production. However, many companies had a lower employee turnover rate. Companies resuming or starting production received more than sufficient employee applications, and many applicants had previous mine experience.

A shortfall loomed in technical services personnel. Economic and mining geologists were difficult to find, and there were

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Robin B. McCulloch, Associate Research Mining Engineer, authored the text of the State mineral industry information provided by the Montana Bureau of Mines and Geology.

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few new graduates and fewer students. Most of the mining-related engineering disciplines were not producing an adequate number of graduates to meet current industry needs let alone the anticipated retirements in the next few years.

Exploration

Exploration is typically an outgrowth of the profit or need for reserves by a mining company. In the past 10 years, the companies have struggled to stay alive so investments in exploration have been minimal. During the first few years of an upturned market cycle, profits are typically reinvested in the mining operations. This is usually in the form of new or rebuilt production equipment or replacement of critical personnel followed by less critical needs. After those needs are met, the companies often invest a portion of their profits into exploration. In Montana, exploration is currently being fueled by venture capital speculation on stock and by commodity prices. Major companies have shown little, if any, activity in the State.

New companies comprised of seasoned industry professionals have started reassembling property packages based on historical exploration programs, such as molybdenum programs of the 1970s, the gold programs of the late 1980s and early 1990s, and even the iron and tungsten programs of the 1950s. Many portfolios include diversified commodities and mining methods. Interest in placer gold has also been steadily increasing but mostly for small-scale operations. Overall, exploration in Montana exhibited a modest increase in activity during the previous years. With little exception, activities were focused on property acquisition by purchase or claim staking.

In the northwest corner of the State, Idaho General Mines Inc. worked on its Molly Star property near Thompson Falls. Their focus was on a Lupine-type target and encompassed molybdenum and copper deposits in the area.

Near the Troy deposit (Spar Lake), Genesis Inc. (subsidiary of Revett Silver Co.) drilled to expand the reserve base of the strata-bound copper-silver deposit that they were mining in 2004. The company reported positive results and indicated more drilling in the future.

North of Butte, O.T. Mining Corporation started an extensive diamond-drilling program on the Ruby mine property and the surrounding area, based on results of a Mobile Metal Ions[4] geochemical soil survey and an extensive "Titan 24" ground geophysical survey (O.T. Mining Corp., 2004§[5]).

The survey focused on a deep copper-porphyry target below the volcanic rocks covering the Boulder batholith. Results of Hole NA04-6 showed 179 meters (m) of nonmineralized volcanic cover overlying intercepts of copper mineralization in batholith rocks. A number of short (less than 1.5 m) intercepts ranged in grade from 0.2% to 0.34% copper. The winter drilling program was stopped at 584 m to allow an endangered lynx to go undisturbed during the winter months. The hole will be deepened in the spring. The 2005 drilling budget for O.T. Mining is estimated to be about 5,500 m.

East of Boulder, Elkhorn Goldfields, Inc. continued diamond drilling with two rigs to define the gold deposits discovered by Goldfields and Santa Fe. They have completed blocking out reserves on the north end of their property package and have completed a prefeasibility analysis on the economics. They anticipate production will commence this year at a level not exceeding 450 metric tons per day (t/d).

South of Melrose, one individual continued compilation of data and testing on the Browns Lake garnet-tungsten skarn. Through mapping and drill data, a reserve of 2.3 million metric tons (Mt) of 0.6% tungsten trioxide (WO_3) has been identified. The zone was described as 6 to 9 m thick, 600 m long, and 120 to 150 m wide. Additional beds containing lower grade resources may bring the overall thickness to 20 to 24 m, even though grade is projected be reduced to 0.3% WO_3. In addition, testing has demonstrated that the garnet waste from this operation is excellent as an abrasive for water-jet cutting of aluminum and mild steel. The existing tailings ponds from the earlier mining operations are estimated to contain approximately 1.8 Mt of sized and preground garnet. This same individual is developing markets and planning to start development of his business this year.

South of Columbus and Big Timber, Beartooth Platinum Corporation explored for platinum-group metals with four diamond-drill holes in the Iron Mountain and Picket Pin areas of the Stillwater Complex. The program was started late in the season and showed favorable results. An extensive drilling program is planned for 2005.

Near Virginia City (south of Butte), Ruby Valley Garnet, LLC. purchased the Ruby Garnet operation from the Montana-Oregon Investment Group. A higher grade deposit was also purchased. The company worked through the fall, testing the deposit and equipment and expected to be in production in 2005. Current reserves are adequate for 3 to 4 years of operations, but resources are projected to support 20 to 30 years of mining. Annual production is anticipated to be 9,000 metric tons (t). The company will focus on wholesale production of garnets for abrasive blasting medium, water filters, and water-jet cutting.

Commodity Review

Industrial Minerals

Cement.—Near Three Forks, Holcim (US) Inc. continued to work on its permit to replace 15% of conventional fuel needs by burning waste tires. Also, an anticipated $1.2 million capital improvement program during the next 2 years was scheduled for the plant to reduce flue dust emissions and process dust. Local cement markets were very strong and supplies were tight. The company indicated that its local market was one of the most rapidly growing in the Nation. Plant production has been sold out for the next 2 years. The company was the "exporter of the year" for the State of Montana. The operation has been recommended for ISO ratings of 14.001 and 9.001, which are for high environmental and performance standards.

[4] Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

[5] References that include a section mark (§) are found in the Internet References Cited section.

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Gemstones.—Near Lewistown, Yogo Creek Mining has temporarily closed for the winter. Its inclined shaft is completed to 130 m (vertical), and they have encountered gangue that is too hard to allow for release of the sapphires by simple washing. Future operations are dependent on discovery of additional reserves. If additional reserves cannot be developed, closure may take place within the next year. Customer demand has risen so that the mine and process facilities cannot produce at a sufficient rate to meet it.

Talc.—East of Dillon, Barretts Minerals, Inc. increased production from the Regal and Treasure talc mines. The company planned to increase its fleet size as well as its workforce. It added a new storage silo at the mill and planned to upgrade processing equipment. In early 2005, Barretts expected to complete a stripping and stabilization program in the Treasure Pit that was initiated by a pit wall failure in 2004. The company also planned to move the county road around the Regal Pit in the near future to increase safety for the public as the ore body is developed.

South of Ennis, Luzenac America Inc. experienced similar market strength in its talc sales, even though they operated in somewhat different markets. They also looked at some upgrades in equipment and at a modest increase in labor. Work in the South 40 Pit has developed 50 years' reserves of high-quality talc.

Metals

Copper, Molybdenum, and Silver.—In the northwest corner of Montana (Lincoln County), Genesis Inc. (a wholly owned subsidiary of Revett Silver Co. in Spokane, WA) resumed production at the Troy Mine (Stromnes, 2005§). Revett Minerals holds approximately 67% of the outstanding shares of Revett Silver. The Troy Mine produced 5,900 t/d of ore, averaging 54 grams per metric ton silver and 0.65% copper and planned to employ 150 people. The Troy Mine hired about 65 people by December 2004 from a pool of more than 650 applications. Purchases included a number of new trucks and drills, although delivery was delayed. Many of the Troy Mines' older trucks were modified with new engines to meet the Environmental Protection Agency's emission standards. Full employment and production started at the end of 2004. Funding was secured in part by a royalty agreement with Royal Gold Inc. on future production of the Troy and Rock Creek Mines. In 1999, Revett Silver acquired 100% of the Troy and Rock Creek Mines and several exploration properties in the area. If tests are promising, production from the Rock Creek Mine will start up in 2008 or 2009 (Revett Minerals, Inc., 2006§).

Genesis will operate as a contractor for ASARCO Incorporated (which formerly owned the Troy and Rock Creek Mines) until enough cashflow is generated to allow them to develop a cash bond for reclamation. It also planned to start development of the production incline for the Rock Creek Mine next summer. Troy has 2- to 5-year reserves (7.9 Mt), and Rock Creek has production potential for 30-plus years. Continuing litigation by environmental groups is expected because of the belief among some that Asarco buried barrels of waste material near the Troy Mine.

East of Noxon and the Rock Creek property, Mines Management, Inc. was expected to reapply for permits for the Montanore Mine that was previously permitted by Noranda. This major copper-silver property was expected to be repermitted within a year or perhaps a bit longer.

At Butte, Montana Resources took delivery of six Caterpillar 240-metric-ton (t) ore trucks in the last half of 2004. This acquisition greatly increased production and lowered costs. Two Ingersoll (IR-270SP) drills were also on order and delivery dates are unknown. Many of the older trucks have been updated with new engines to allow continued use. A new Bucyrus International BE-495HD shovel has been ordered and is expected to be onsite in the third or fourth quarter of 2005. This shovel will load the larger-capacity trucks more effectively.

Montana Resources, which restarted the Continental Pit in November 2003, benefited from much higher commodity prices. Production for 2004 was estimated to be 29,000 t of copper, 2,700 t of molybdenum, and 18,000 kilograms of silver. A substantial production bonus was divided between the company's 350 employees.

Gold.—Northeast of Avon, an individual continued small-scale gold placer production on Ophir Creek. He increased production when he replaced his cable backhoe with a Timberjack tool modified to be an all-terrain excavator.

Near Nevada City, an individual continued mining gold from the lower Browns Gulch placer (Bubany placer). In many areas, values were reported to be as high as $131 per cubic meter, with fine and coarse gold being recovered. Mining was difficult because the gravels were covered with up to 12 m of clay and silt from earlier placer operations. The lower portion of the drainage has been reclaimed. Work will continue in the coming spring in the upper segment of the property where the gulch narrows.

East of Butte, Placer Gold Inc. started processing gold ore at its Golden Sunlight Mine 6 months earlier than originally planned. A previously unknown ore body, estimated to contain 726,000 t, was discovered while stripping for the stage 5B pit expansion. The current mine life is 4 years, but the company is initiating an extensive exploration program to look for potential ore bodies remaining on the property. The company planned to hire 15 new employees.

North of Townsend, an individual produced placer gold from the high benches in Confederate Gulch. Operations in the main gulch above Diamond City have been delayed while the person awaited a 404 Permit from the Corps of Engineers to allow him to disturb a dry streambed. Tests during the summer demonstrated that after mining and reclamation, surface flows in the dry streambed will probably be restored and that downstream water users will not be harmed during operations.

Lead and Zinc.—Near Boulder, Apollo Gold Corp. nearly completed an extensive stripping program at its Montana Tunnels Mine (gold, silver, lead, and zinc). The combination of a pushback and a major wall failure on the west side created need for an extensive stripping program that was recently completed. The remaining mine life was expected to be approximately 4 years. Many of its trucks have accumulated extensive hours, and the company planned to rebuild many of the trucks in the face of a short mine life and extended delivery

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date for new equipment. The company also applied for a permit to expand the pit to the north. The expansion was expected to extend the mine life to 2011. If approved, the company planned to initiate a stripping program in about 2 years.

Platinum-Group Metals.—In the Big Timber area, Stillwater Mining Company embarked on an extensive development program to bring the East Boulder Mine ore production to a level of 1,800 t/d by 2007. Current ore production averages 1,200 t/d. This program was in progress when the contractors were laid off in 2001. Part of the program included an aggressive equipment purchase and rebuild program but implementation was somewhat impeded by delays in equipment delivery. Development was expected to approach 9,000 m in 2005. Moran Mining & Tunnelling Ltd. drove a 550-m ventilation raise with an Alimak Raise Climber, which allowed improved ventilation. With tailing ponds enlarged to the Stage II permit capacity, the company expected to produce about 900,000 t of waste rock in 2005.

Stillwater also experimented with conventional cut-and-fill mining methods and used slushers to see if recovery could be increased and dilution reduced in order to cut costs. The mechanized methods were fast, have greater ventilation needs, and the 50-degree dip of the ore body results in higher dilution rates. The 2-m muckers required a 2.4-m mining width, resulting in severe dilution of the typical 1.2-m to 2-m mineralized zones.

Stillwater Mining negotiated a 3-year contract with the labor union at the Stillwater Mine near Nye. They drove a ramp off the bottom of the shaft but will have to deepen the shaft eventually. They are enlarging its haulage equipment to 27-t trucks on the ramps. They added a cobalt-recovery circuit at the base-metal refinery and increased capacity to recycle a higher percentage of automotive catalytic converters. Platinum and palladium prices were up, and the mines were profitable at 2004 prices.

Southeast of Big Timber in the Deer Creek drainage, North Star Mining, Inc. completed 260 m of development on an underground quartz-sulfide-hosted precious-metal mine. Their gravity and flotation mill (113 t/d) was functional, but the company temporarily closed the mill until it can resolve recovery losses. The company also experienced problems securing a contract with a smelter that can deal with the chromite in the concentrates and recover rhodium and iridium. The company planned to resume development in 2005 and production when a favorable smelting agreement is reached.

Legislation and Government Programs

Early in the year, Canyon Resources Corp. funded an initiative campaign to legalize open pit, heap-leach gold mines. The initiative (I-147) qualified for the November general election ballot, but was defeated.

The Montana Department of Envirnomental Quality (DEQ) and the Bureau of Land Management released their supplemental environmental impact statement on the Golden Sunlight Mine Pit Reclamation (Montana Department of Environmental Quality and U.S. Bureau of Land Management, 2004§). The document recommended against the backfill of the pit based on potential damage to the environment. It remains to be seen how this recommendation will affect the lawsuit against the DEQ by environmental groups during the permitting of the major mine expansion in 1998.

The MBMG studied mining, minerals, ground water, and geology. Geologic mapping continued with Federal matching funding from the STATEMAP program, a component of the USGS National Cooperative Geologic Mapping Program (NCGMP). Under the STATEMAP program, 4 quadrangles (1:100,000) were released in digital form, which completed most of the 94 quadrangles. A total of 51 open-file reports, which ranged from geologic maps to the origin of sapphires; 1 pamphlet; 2 reports of investigation; 1 miscellaneous contribution; and 2 special publications were produced during the biennial funding period. These documents may be ordered through the MBMG Web site at URL http://www.mbmg.mtech.edu/.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Clays, bentonite		181	14,900	181	14,900	102	8,400
Gemstones		NA	424	NA	707	NA	653
Palladium[3]	kilograms	14,800	162,000	14,000	91,400	13,700	102,000
Platinum[3]	do.	4,390	76,500	4,170	93,100	4,040	110,000
Sand and gravel, construction		16,700	76,000	15,200	74,200	14,400	80,000
Stone:							
Crushed		2,370	10,000	3,060	12,200	4,090	17,500
Dimension		12	2,620	14	2,590	14	2,550
Combined values of cement [masonry (2002-03), portland], clays (common), copper (2003-04), garnet [industrial (2002)], gold, lead, lime, molybdenum concentrates (2003-04), peat, silver, talc (crude), zinc		XX	129,000	XX	205,000	XX	303,000
Total		XX	471,000	XX	494,000	XX	624,000

NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

TABLE 2
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	5	1,400	$6,270 r	$4.47	7	2,430	$9,900	$4.07	8	2,960	$13,600	$4.61
Marble	--	--	--	--	--	--	--	--	2	W	W	2.97
Granite	3	W	W	3.64	3	W	W	3.75	3	W	W	3.75
Sandstone and quartzite	3	W	W	3.64	2	43	150	3.49	2	44	153	3.48
Traprock	2	W	W	4.09	1	W	W	3.86	2	W	W	3.88
Volcanic cinder and scoria	-- r	-- r	-- r	-- r	1	W	W	3.15	1	W	W	3.14
Miscellaneous stone	8 r	126 r	496 r	3.94 r	5	74	272	3.68	4	133	485	3.65
Total or average	XX	2,370	10,000	4.23	XX	3,060	12,200	3.99	XX	4,090	17,500	4.27

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Concrete aggregate (+1½ inch), riprap and jetty stone	W	W	$6.65
Coarse aggregate graded:			
Concrete aggregate coarse	(2)	(2)	2.81
Bituminous surface-treatment aggregate	(2)	(2)	3.75
Railroad ballast	(2)	(2)	3.86
Total or average	241	$917	3.80
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	4.13
Unpaved road surfacing	(2)	(2)	3.73
Total or average	267	1,000	3.76
Other construction materials	20	92	4.60
Agricultural:			
Agricultural limestone	(2)	(2)	3.37
Poultry grit and mineral food	(2)	(2)	20.88
Total or average	17	239	14.06
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	2.97
Lime manufacture	(2)	(2)	6.03
Sulfur oxide removal	(2)	(2)	2.47
Total or average	1,140	4,950	4.34
Special, mine dusting or acid water treatment	W	W	14.49
Unspecified:[3]			
Reported	91	292	3.21
Estimated	1,300	4,600	3.64
Total or average	1,360	4,900	3.61
Grand total or average	3,060	12,200	3.99

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company propriety data, included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Concrete aggregate (+1½ inch), riprap and jetty stone	W	W	$9.80
Coarse aggregate graded, concrete aggregate coarse	W	W	3.67
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	4.93
Unpaved road surfacing	(2)	(2)	3.75
Crusher run or fill or waste	(2)	(2)	3.45
Other coarse and fine aggregates	127	$418	3.29
Total or average	308	1,130	3.68
Other construction materials	1	6	6.00
Agricultural, poultry grit and mineral food	W	W	17.34
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	2.96
Lime manufacture	(2)	(2)	9.00
Sulfur oxide removal	(2)	(2)	2.36
Total or average	1,730	8,940	5.16
Special, mine dusting or acid water treatment	W	W	39.52
Unspecified:[3]			
Reported	602	1,880	3.12
Estimated	1,400	5,100	3.67
Total or average	1,980	6,930	3.50
Grand total or average	4,090	17,500	4.27

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company propriety data, included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W
Coarse and fine aggregates[4]	W	W	W	W
Other construction materials	10	40	10	52
Agricultural[5]	W	W	W	W
Chemical and metallurgical[6]	W	W	W	W
Special[7]	W	W	W	W
Unspecified:[8]				
Reported	6	22	86	269
Estimated	1,100	4,200	120	450
Total	2,260	8,970	799	3,230

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone.

[3]Includes concrete aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

[4]Includes graded road base or subbase and unpaved road surfacing.

[5]Includes agricultural limestone and poultry grit and mineral food.

[6]Includes cement and lime manufacture and sulfur oxide removal.

[7]Includes mine dusting or acid water treatment.

[8]Reported and estimated production without a breakdown by end use.

TABLE 4b

MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W
Coarse and fine aggregates[4]	W	W	W	W
Other construction materials	--	--	1	6
Agricultural[5]	--	--	W	W
Chemical and metallurgical[6]	W	W	W	W
Special[7]	--	--	W	W
Unspecified:[8]				
Reported	475	1,410	127	463
Estimated	1,400	5,100	--	--
Total	2,840	12,900	1,240	4,550

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone.

[3]Includes concrete aggregate (coarse).

[4]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[5]Includes poultry grit and mineral food.

[6]Includes cement and lime manufacture and sulfur oxide removal.

[7]Includes mine dusting or acid water treatment.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	1,120	$7,370	$6.57
Asphaltic concrete aggregates and other bituminous mixtures	1,460	9,190	6.28
Road base and coverings[3]	3,980	17,900	4.51
Fill	624	2,930	4.70
Snow and ice control	104	489	4.72
Railroad ballast	182	824	4.53
Other miscellaneous uses	94	983	10.46
Unspecified:[4]			
Reported	3,550	16,300	4.59
Estimated	4,100	18,000	4.39
Total or average	15,200	74,200	4.86

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,160	$8,040	$6.93
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	13	57	4.50
Asphaltic concrete aggregates and other bituminous mixtures	1,010	14,100	13.98
Road base and coverings	3,110	15,400	4.96
Fill	707	3,170	4.49
Snow and ice control	61	382	6.26
Other miscellaneous uses[3]	428	2,210	5.16
Unspecified:[4]			
Reported	3,090	14,400	4.67
Estimated	4,800	22,000	4.64
Total or average	14,400	80,000	5.57

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a

MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	613	4,050	509	3,320	--	--
Asphaltic concrete aggregates and other bituminous mixtures	946	6,140	185	1,130	332	1,930
Road base and coverings[3]	2,360	11,100	1,330	5,250	284	1,560
Fill	W	W	W	W	11	58
Railroad ballast	182	824	--	--	--	--
Other miscellaneous uses[4]	733	4,150	78	195	--	--
Unspecified:[5]						
Reported	635	3,020	1,670	7,530	1,250	5,760
Estimated	3,200	14,000	960	4,300	--	--
Total	8,640	43,200	4,730	21,700	1,870	9,310

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

TABLE 6b

MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	754	5,920	419	2,170	--	--
Asphaltic concrete aggregates and other bituminous mixtures	509	8,840	159	943	339	4,310
Road base and coverings	1,740	8,830	974	4,340	394	2,230
Fill	568	2,780	65	145	74	245
Other miscellaneous uses[3]	473	2,540	15	48	(4)	1
Unspecified:[5]						
Reported	1,240	5,800	1,840	8,620	7	13
Estimated	3,800	18,000	1,000	4,700	--	--
Total	9,040	52,200	4,510	21,000	814	6,800

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes railroad ballast and snow and ice control.

[4]Less than ½ unit.

[5]Reported and estimated production without a breakdown by end use.

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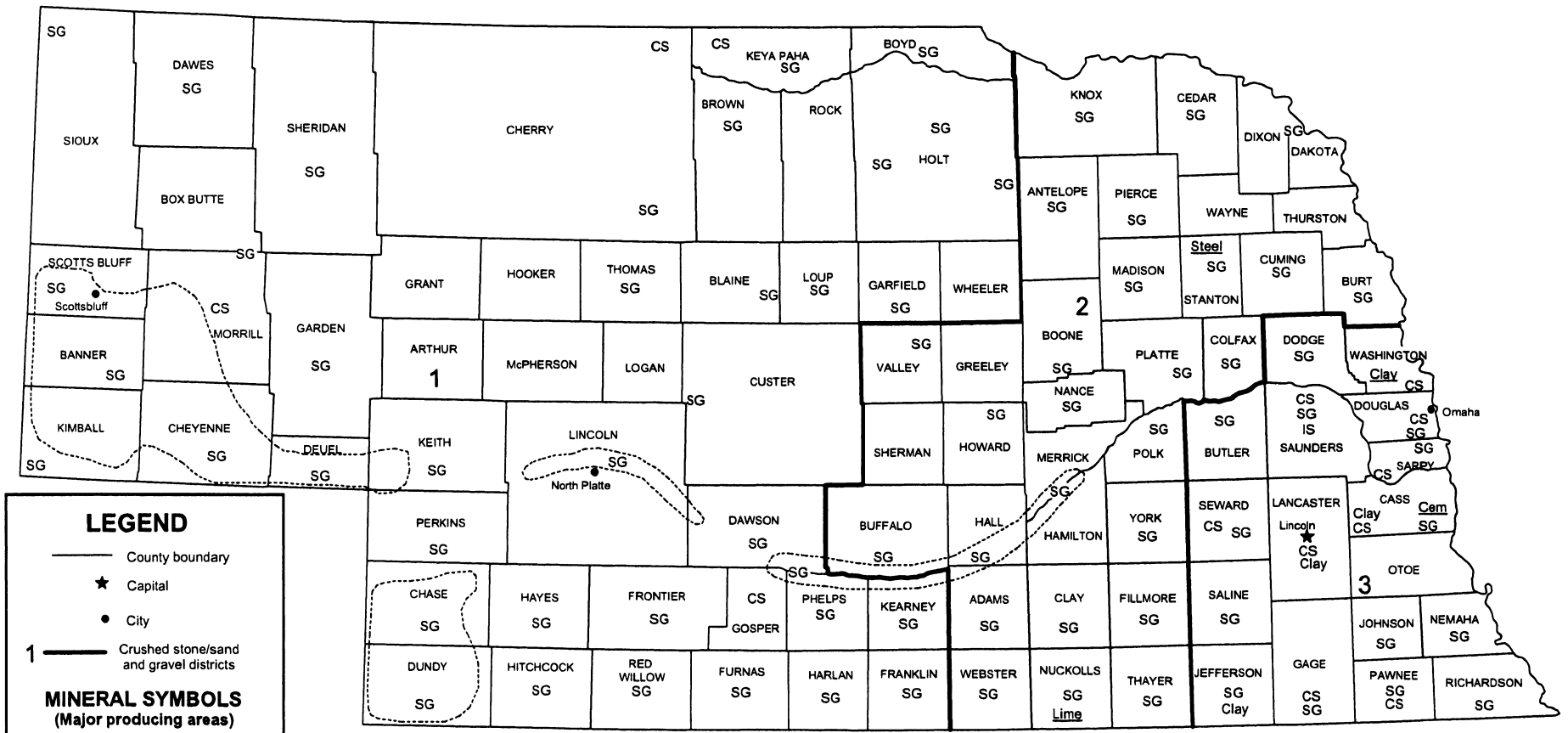
NEBRASKA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
Clay	Clay plant
CS	Crushed stone
IS	Industrial sand
Lime	Lime plant
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

Source: University of Nebraska-Lincoln, Nebraska Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NEBRASKA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Nebraska-Lincoln, Nebraska Geological Survey, for collecting information on all nonfuel minerals.

In 2004, Nebraska's nonfuel raw mineral production was valued[1] at $106 million, based upon annual U.S. Geological Survey (USGS) data. This was an 11.2% increase compared with that of 2003,[2] which was down about 3.2% from 2002. (The State's actual total nonfuel mineral values for 2002-04 were substantially higher than those reported in table 1, from which specific production data for industrial sand and gravel and masonry and portland cements were withheld to protect company proprietary data.)

In 2004, Nebraska's leading nonfuel mineral commodities were, in descending order of value, cement (portland and masonry), construction sand and gravel, and crushed stone. Increases in the values of each commodity took place in 2004. A nearly 14% increase in construction sand and gravel production in 2004 combined with a 4% increase in the average price per metric ton generated an 18%, or $8.2 million, increase in the commodity's value from that of 2003. Although there was a slight decrease in production, the value of crushed stone increased by $2.7 million, because of a 6% price increase in the average price per ton. Increases also took place in the values of masonry and portland cement, the latter of which rose by more than $4 million (table 1).

Nebraska continued to be a producer of significant quantities of construction sand and gravel in 2004, as compared with other producing States. Metals that were produced in the State—mostly raw steel—were processed from materials acquired from other domestic and foreign sources.

In 2003, Nebraska's total nonfuel mineral value decreased mainly as a result of a $4 million drop in the value of crushed stone (table 1). This was offset somewhat by an increase in value of construction sand and gravel by $800,000. Cement (masonry and portland) production decreased and its value decreased about $4 million from 2002 owing to drops in production and average price per ton.

The following narrative information was provided by the Nebraska Geological Survey[3] (NGS).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Matthew Joeckel, Research Geologist with the University of Nebraska-Lincoln and the Nebraska Geological Survey (NGS), authored the text of the State mineral industry information provided by the NGS.

Commodity Review

Industrial Minerals

Clays.—Yankee Hill Brick and Tile's new plant at Lincoln was completed in 2004 and was scheduled to open in 2005. Production was anticipated to double relative to previous levels. Robots are employed to load bricks on kiln cars and the entire facility is computer controlled. As a result, the company's yearly mining of Cretaceous Dakota Formation clays will probably increase from 45,000 to 54,000 metric tons per year (t/yr) to 90,000 to 109,000 t/yr. Most of the company's raw materials now come from one active mine and, therefore, additional suitable clay deposits will probably be sought in the near future.

Endicott Clay Products Co., which also uses Dakota Formation clays, supplied brick and tile to more than a dozen major construction projects across the United States and Canada in 2004. Included in these projects are: Canton Crossing Towers (Baltimore, MD), Institute of Arts (Flint, MI), Four Seasons Performing Arts Center (Toronto, Ontario, Canada), Riverwalk (Fort Lauderdale, FL), Walker Arts Center (Minneapolis, MN), and Lambeau Field renovation (Green Bay, WI). In addition to its mine at the plant site in Endicott, the company operated a new mine south of Fairbury, NE, and one in northern Kansas. Both of the latter yield gray sandy mudstones and mudstones, as opposed to the red-mottled mudstones mined at the plant site.

Blair Ag LLC (Blair) continued to ship dry attapulgite (palygorskite) clay by rail from Florida for the production of liquid clay suspensions for agrochemicals, a market that has been declining in recent years. In August 2004, however, the company also began transloading dry attapulgite onto trucks for distribution to other plants in Colorado, Iowa, Kansas, and Nebraska. Through an agreement with Engelhard Corporation, Blair was paid for consignment on these shipments.

Crushed Stone and Sand and Gravel.—Aggregate demand and sales were high in 2004, generally showing a significant increase over 2003. This trend was apparent in both major centers of aggregate mining: the Weeping Water limestone-mining district in eastern Nebraska and the fluvial gravel operations concentrated along the Platte River system. The aggregates market is expected to remain highly favorable through 2005.

Martin Martietta Aggregates (Weeping Water) began work on a new plant at its underground limestone mining operations in May 2004. The new facility, located in the uplands to the south of the present valley-side decline, will include a primary crusher at the mine mouth and a secondary crusher at the plant itself. Material will be moved from the mine mouth to the plant by a conveyor system. Martin Marietta's Weeping Water Mine set alltime sales records for crushed stone and concrete aggregate

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in 2004. Kereford Limestone Company (Weeping Water) also reported 2004 as a record year in total product sales. Aggregate for asphalt and concrete paving and for Ready-MixTM concrete constituted major sales sectors. The company's fine-grind facilities also allowed it to supply granules for asphalt shingle production and fine calcium carbonate for liquid lime production, palletized lime, and other applications.

Rinker Materials Corp.'s Ft. Calhoun Stone (Ft. Calhoun) completed a major upgrade of its East Plant in 2004, increasing production capacity by 20%. The company began an upgrade of its barge-loading facility on the Missouri River, the only such facility in Nebraska, by adding a conveyor unit. Ft. Calhoun Stone also added a new aggregate-washing facility to meet Nebraska Department of Roads (NDOR) 47B concrete aggregate specifications. The company provided a total of 32,000 metric tons (t) of riprap for Corps of Engineers habitat restoration along the river.

Changes in NDOR specifications are relevant in the aggregate, concrete, and fly ash industries. A 2004 special provision in NDOR specifications now allows the use of bituminous millings, crushed concrete, or virgin aggregate as base course material. NDOR already uses essentially all of the crushed concrete that it produces through roadbuilding projects, but the change in specifications was still expected to increase the recycling of concrete in road projects. In a second specification change, the use of Class C fly ash was omitted in pavement use in a revision to NDOR supplemental and standard specifications in late 2003. This change was a provisional response to the cracking of pavements under certain conditions, but no actual link between pavement problems and the use of Class C fly ash has yet been demonstrated. Class F fly ash, produced outside Nebraska, can still be used in pavements. Class C fly ash from Nebraska's coal-fired powerplants continued to be used in soil stabilization operations and, in fact, demand in that area appeared to be increasing. Nebraska Class C fly ash was also used extensively in Ready-MixTM concrete plants in Colorado, Iowa, and Nebraska.

ILC Resources (formerly Iowa Limestone) in Weeping Water continues to produce feed-grade calcium carbonate from materials mined at Kereford Limestone's Weeping Water operations. Favorable livestock prices in the United States in 2004 supported very good sales, although rising energy prices also forced product price increases. Sales increased approximately 8% more than that of 2003. Lime production continued at Lyon Lime's operation at Nelson, NE.

Metals

Iron and Steel.—Nucor-Nebraska (Norfolk) recycled 1 million metric tons of scrap steel in 2004, including more than 400,000 automobiles. On December 22, 2004, Nucor-Nebraska set a record of 900,000 t of product produced in a single year. The 2004 Household Scrap Day sponsored by the company recovered 54.4 t of steel scrap and 2.58 t of recyclable aluminum.

Uranium.—Crow Butte Resources, Inc. produced 375 t of U_3O_8 in 2004, an increase from that of 2003 production. Prospects for uranium production in Nebraska and elsewhere are improving significantly: prices have increased steadily since 2003, more than tripling since 2000 and reaching their highest level since the mid-1980s. Crow Butte is now in the process of permitting new in situ leaching production sites in Nebraska. Groundwater remediation at Crow Butte's Wellfield No. 2 was completed in 2004 and it is now in the stabilization phase.

Environmental Issues

In August of 2004, the State of Nebraska dropped an appeal effort and agreed to pay $141 million to the Central Interstate Low-Level Radioactive Waste Compact in response to a Federal court judgment dating back to 2002. Negotiations toward disposal of low-level radioactive wastes in Texas were ongoing, and eventually an agreement might be reached.

Ash Grove Cement Co.'s Louisville plant received permission from the Nebraska Department of Environmental Quality (NDEQ) to burn scrap tires for fuel in its kiln in 2004, despite concerns expressed by some residents of the area and from environmental groups. Only a trial period of 60 days, with extensive monitoring of nitrogen and sulfur oxides emissions, was approved. Regular burning of scrap tires would require separate permitting from the NDEQ. It was projected that regular use of scrap tires as kiln fuel could reduce the plant's coal consumption by 10% to 20% and consume about 1 million waste tires.

Lead contamination in soils in urban Omaha, resulting from a former ASARCO Incorporated plant and possibly from two smaller operations, received much attention during 2004. The U.S. Environmental Protection Agency (EPA) reported that 35% of 15,012 residential yards analyzed in the Omaha area had lead values above the 400 parts per million (ppm). A full 42% of residential lawns from Ames Avenue to "L" Street and from 45th Street to the Missouri River exceeded EPA-mandated threshold levels. The EPA planned on cleaning up about 5,600 "high-priority" residential yards first. The costs for lead cleanup were estimated to be as much as $100 million in June 2004. The city council of Bellevue, NE (immediately south of Omaha) voted in the summer of 2004 to oppose the use of as much as 340,000 t of lead-contaminated soil from Omaha as fill around its sewage-treatment plant, a plan that might otherwise have saved $4.5 million for landfilling all of the Omaha's contaminated soil in Mills County, Iowa. Some lead-contaminated soil from the Asarco plant site already has been used as fill under Omaha's new, concrete-sheathed Lewis and Clark Landing along the Missouri River.

The Conservation and Survey Division (Nebraska Geological Survey) is scheduled to move into the newly renovated Hardin Hall on the University of Nebraska-Lincoln's East Campus in the fall of 2005, following its merger with the School of Natural Resources.

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Government Programs

In 2004, the Conservation and Survey Division's USGS STATEMAP mapping efforts produced mineral-resource maps of the Reynolds, Fairbury SW, and Endicott 7.5-minute quadrangles (topographic). Pleistocene sand and gravel deposits and Cretaceous clay and limestone resources of the Dakota and Greenhorn formations, respectively, were mapped.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEBRASKA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	W	(3)	W	(3)	W	(3)
Portland	W	(3)	W	(3)	W	(3)
Clays, common[e]	133	338	133	338	133	338
Gemstones	NA	4	NA	4	NA	4
Lime	8	692	8	692	11	514
Sand and gravel:						
Construction	12,900	44,200	13,300	45,000	15,100	53,200
Industrial	W	(3)	W	(3)	W	(3)
Stone, crushed	7,220	53,200	6,960	49,200	6,900	51,900
Total	XX	98,400	XX	95,300	XX	106,000

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
NEBRASKA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	11	7,220	$53,200	$7.36	10	6,960	$49,200	$7.07	9	6,900	$51,900	$7.52

[1]Data are rounded to no more than three significant digits.

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TABLE 3a

NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$9.39
Other coarse aggregate	W	W	9.36
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	10.34
Bituminous aggregate, coarse	W	W	6.15
Bituminous surface-treatment aggregate	W	W	5.27
Fine aggregate (-⅜ inch), screening, undesignated	W	W	5.11
Coarse and fine aggregates:			
Unpaved road surfacing	336	$3,170	9.42
Crusher run or fill or waste	265	2,330	8.80
Roofing granules	W	W	8.16
Total or average	601	5,500	9.15
Agricultural:			
Agricultural limestone	622	5,760	9.26
Other agricultural uses	79	550	6.96
Total or average	701	6,310	9.00
Chemical and metallurgical, cement manufacture	W	W	4.41
Special, asphalt fillers or extenders	W	W	19.01
Unspecified:[2]			
Reported	3,570	23,500	6.59
Estimated	60	220	3.75
Total or average	3,630	23,800	6.55
Grand total or average	6,960	49,200	7.07

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

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TABLE 3b

NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	$12.76
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	9.53
Bituminous aggregate, coarse	(2)	(2)	8.85
Railroad ballast	(2)	(2)	11.35
Total or average	1,550	$14,600	9.43
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	10.29
Unpaved road surfacing	(2)	(2)	9.82
Crusher run or fill or waste	(2)	(2)	7.72
Roofing granules	(2)	(2)	8.16
Total or average	965	8,400	8.70
Agricultural:			
Agricultural limestone	(2)	(2)	12.66
Other agricultural uses	(2)	(2)	6.99
Total or average	342	3,960	11.56
Chemical and metallurgical, cement manufacture	W	W	4.41
Special, asphalt fillers or extenders	W	W	20.23
Unspecified:[3]			
Reported	3,390	22,600	6.67
Estimated	51	190	3.73
Total or average	3,440	22,800	6.63
Grand total or average	6,900	51,900	7.52

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 3	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Fine aggregate (-¾ inch)[5]	W	W
Coarse and fine aggregate[6]	W	W
Agricultural[7]	701	6,310
Chemical and metallurgical[8]	W	W
Special[9]	W	W
Unspecified[10]		
Reported	3,570	23,500
Estimated	60	220
Total	6,960	49,200

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No production reported in Districts 1 and 2.
[3]Includes riprap and jetty stone and other coarse aggregates.
[4]Includes bituminous aggregate (coarse), bituminous surface treatment aggregate, and concrete aggregate (coarse).
[5]Includes screening (undesignated).
[6]Includes crusher run (select material or fill), roofing granules, and unpaved road surfacing.
[7]Includes agricultural limestone and other agricultural uses.
[8]Include cement manufacture.
[9]Includes asphalt fillers or extenders.
[10]Reported and estimated production without a breakdown by end use.

TABLE 4b

NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 3	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Coarse and fine aggregate[5]	W	W
Agricultural[6]	342	3,960
Chemical and metallurgical[7]	W	W
Special[8]	W	W
Unspecified:[9]		
Reported	3,390	22,600
Estimated	51	190
Total	6,900	51,900

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No production reported in Districts 1 and 2.
[3]Includes riprap and jetty stone.
[4]Includes bituminous aggregate (coarse), concrete aggregate (coarse), and railroad ballast.
[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, and unpaved road surfacing.
[6]Includes agricultural limestone and other agricultural uses.
[7]Include cement manufacture.
[8]Includes asphalt fillers or extenders.
[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,830	$6,090	$3.32
Plaster and gunite sands	74	310	4.19
Concrete products (blocks, bricks, pipe, decorative, etc.)	4	9	2.25
Asphaltic concrete aggregates and other bituminous mixtures	712	2,110	2.96
Road base and coverings	1,840	6,390	3.47
Fill	509	1,020	2.00
Snow and ice control	99	347	3.51
Roofing granules	15	50	3.33
Other miscellaneous uses[2]	56	456	8.14
Unspecified:[3]			
Reported	905	3,020	3.34
Estimated	7,200	25,000	3.49
Total or average	13,300	45,000	3.40

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,650	$9,500	$3.59
Plaster and gunite sands	78	244	3.13
Concrete products (blocks, bricks, pipe, decorative, etc.)	184	775	4.22
Asphaltic concrete aggregates and other bituminous mixtures	960	3,740	3.89
Road base and coverings	2,170	8,590	3.97
Fill	1,160	1,810	1.56
Snow and ice control	68	212	3.14
Roofing granules	3	21	7.00
Other miscellaneous uses[2]	36	643	17.86
Unspecified:[3]			
Reported	1,140	4,610	4.06
Estimated	6,700	23,000	3.46
Total or average	15,100	53,200	3.52

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration and railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	714	2,760	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	1	3	--	--	3	6
Asphaltic concrete aggregates and other bituminous mixtures	W	W	275	912	W	W
Road base and coverings	702	1,900	961	3,490	180	994
Fill	164	340	236	490	109	186
Snow and ice control	69	215	27	111	4	21
Roofing granules	15	50	--	--	--	--
Other miscellaneous uses[3]	687	1,960	12	135	745	2,660
Unspecified:[4]						
Reported	55	224	2	22	848	2,780
Estimated	970	3,200	2,800	9,400	3,500	13,000
Total	2,660	7,860	5,010	17,300	5,370	19,300

Use	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	243	535
Road base and coverings	--	--
Fill	--	--
Snow and ice control	--	--
Roofing granules	--	--
Other miscellaneous uses[3]	--	--
Unspecified:[4]		
Reported	--	--
Estimated	--	--
Total	243	535

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6b
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	482	1,390	W	W	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	81	214	3	10	178	794
Asphaltic concrete aggregates and other bituminous mixtures	W	W	591	1,980	W	W
Road base and coverings	951	3,110	997	4,040	218	1,440
Fill	115	272	251	438	792	1,100
Snow and ice control	43	95	W	W	W	W
Other miscellaneous uses[3]	370	2,150	644	2,370	1,580	6,140
Unspecified:[4]						
Reported	33	243	15	172	1,090	4,200
Estimated	1,200	4,000	2,800	9,900	2,600	9,200
Total	3,260	11,500	5,340	18,900	6,500	22,800

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes filtration, railroad ballast, and roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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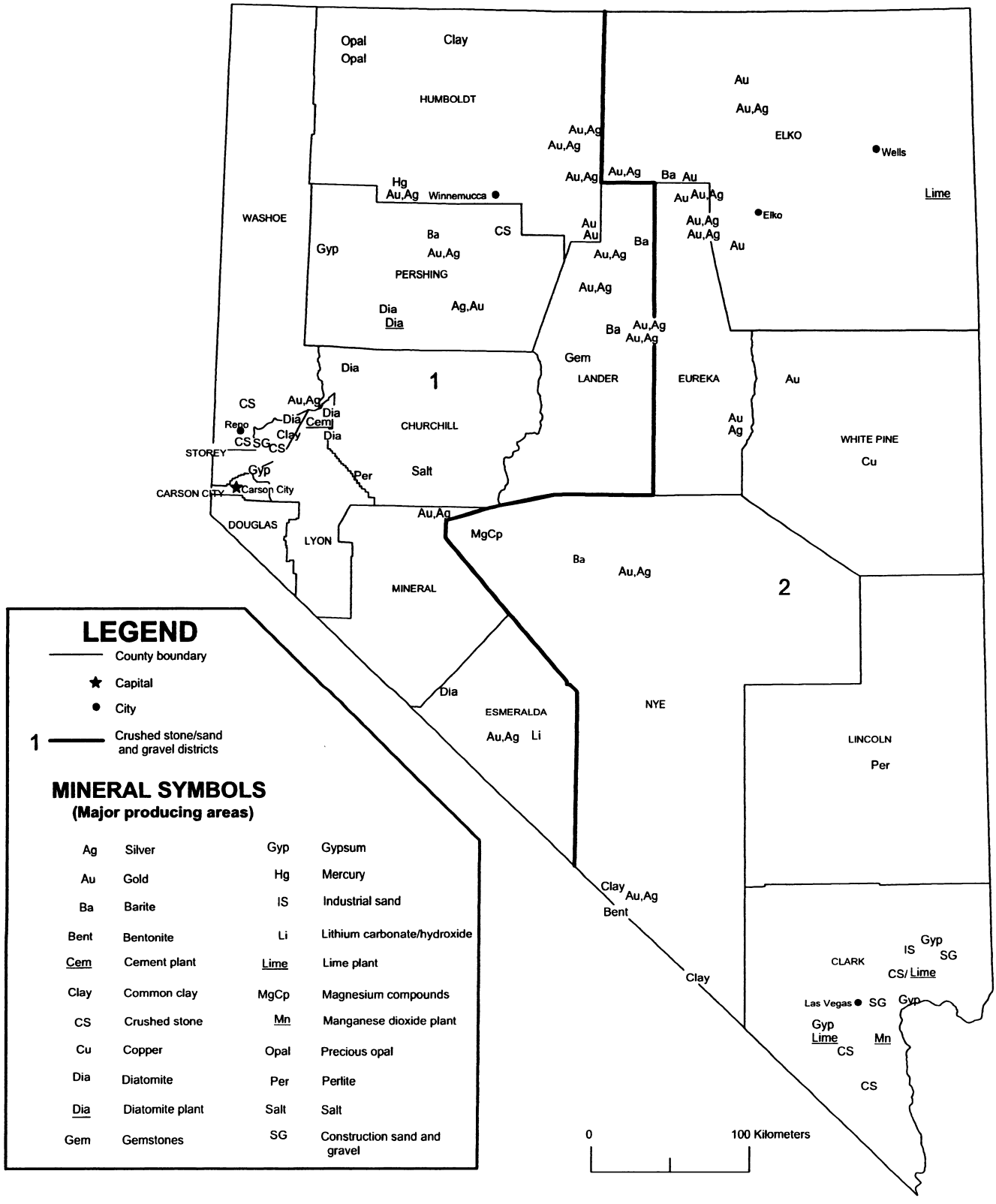
NEVADA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS

(Major producing areas)

Ag	Silver	Gyp	Gypsum
Au	Gold	Hg	Mercury
Ba	Barite	IS	Industrial sand
Bent	Bentonite	Li	Lithium carbonate/hydroxide
Cem	Cement plant	Lime	Lime plant
Clay	Common clay	MgCp	Magnesium compounds
CS	Crushed stone	Mn	Manganese dioxide plant
Cu	Copper	Opal	Precious opal
Dia	Diatomite	Per	Perlite
Dia	Diatomite plant	Salt	Salt
Gem	Gemstones	SG	Construction sand and gravel

Source: Nevada Bureau of Mines and Geology/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NEVADA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Nevada Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 2004, Nevada's nonfuel raw mineral production was valued[1] at $3.47 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $280 million, up 8.7% from 2003,[2] which followed a 9.6% increase of an identical $280 million from 2002. The State, for the 6th consecutive year and for the 11th time in the past 13 years, ranked second in the Nation (1st in 1993 and 1998) in total nonfuel mineral production value, accounting for more than 7.5% of the U.S. total.

Nevada, which has led the Nation in gold production since 1981, provided nearly 84% of the Nation's gold in 2004. In 2004, gold accounted for 82% of the State's total nonfuel raw mineral production value, followed by construction sand and gravel with about 5.7%, lime (company proprietary data), and crushed stone and silver with about 2% each. For the third consecutive year, Nevada ranked second in silver production (first from 1987-2001) accounting for nearly 24% of the silver produced from U.S. mines (30% in 2002 and 26% in 2003).

In 2004, gold led the State's rise in value with an increase of $190 million, a 7% increase from 2003, even though production was down almost 5%. Other particularly significant increases in value (in descending order of change) included those of copper with Quadra Mining Co.'s resumption of mining at the Robinson Mine (company proprietary data), crushed stone and construction sand and gravel, up about $24 million and $23 million, respectively, silver, up $14 million, and a smaller yet significant increase for barite (table 1). These increases were mildly offset by decreases in the values of diatomite (down about $8 million), lime, gypsum, and brucite.

In 2003, a $250 million increase in the value of gold accounted for more than 89% of Nevada's increase in nonfuel mineral value from 2002. Also showing increases in value were construction sand and gravel, up $15 million; lime, up about $11 million; crushed stone, up nearly $7 million; gypsum, up about $5 million; barite, up nearly $4 million; and diatomite, up nearly $2 million. The most significant decreases included those of silver, down about $12 million and portland cement, down about $5 million. Lithium carbonate also showed a small decrease in value (table 1).

In 2004, while Nevada continued to lead the Nation in the quantity of gold produced, it also continued to be the only State to produce magnesite and lithium carbonate minerals (minerals listed in descending order of value) and remained 2d in silver and barite and 7th in lime. While Nevada rose in rank to 8th from 10th in the production of construction sand and gravel, was 5th in copper, and remained a significant producer of industrial sand and gravel, the State decreased to 2d from 1st in diatomite, to 3d from 1st in gypsum, to 7th from 5th in gemstones (based on value), and to 2d from1st in brucite.

Mercury was produced as a byproduct of gold-silver processing but data were not available. Mercury has not been mined domestically as a primary mineral commodity since the closure of the McDermitt Mine in 1992 (Brooks and Matos, 2005§[3]).

The following narrative information was provided by the Nevada Bureau of Mines and Geology[4] (NBMG). Production data in the following text are those reported by the NBMG, based upon its own surveys, estimates, and information gathered from company annual reports. The NBMG data are reported by that agency to be nonproprietary and may differ from some USGS preliminary estimates and production figures as reported to and estimated by the USGS.

Employment

The mining industry directly employed 9,559 people in 2004, and the industry was responsible for another 48,000 jobs related to providing the goods and services needed by the industry and its employees (Driesner and Coyner, 2005a§). On the average, each of the 9,559 workers in the nonfuel mineral industry in Nevada produced approximately $357,800 in mined products in 2004, an alltime high.

Exploration and Development Activities

Exploration activity continued at a high pace in Nevada in 2004. Companies continued the search for high-grade veins in and around old districts but, reminiscent of porphyry copper exploration in the southwest in the late 1960s, pediment areas and valleys with deeper gravel cover were blanketed with new claims. Placer Dome Inc.'s successful activities in the Cortez area spawned serious staking programs by several companies in Antelope District, Kobeh Valley, and Pine Valley of central Eureka County. Although the majority of the exploration activity in the State was concentrated on gold, companies and

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]References that include a section mark (§) are found in the Internet References Cited section.

[4]Jonathan G. Price, the State Geologist, and Stephen B. Castor and Joseph V. Tingley, Research Geologists, coauthored the text of the State mineralindustry information provided by the Nevada Bureau of Mines and Geology.

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individuals also searched for copper, molybdenum, and zinc. The Standard Gold Mine opened in Pershing County, Nevada's first new gold mine since 1998, and in White Pine County, the Robinson copper mine resumed production. More than 28,800 new mining claims were recorded in Nevada in 2004, 63% more than that of 2003. These claims were scattered in 285 districts and areas across the State, but major activity was in the Antelope District (3,147 claims), the Kobeh Valley area (1,606 claims), Bald Mountain (1,404 claims), and the Pine Valley area (1,217 claims).

Exploration in 2004 included high-grade (mostly vein) targets, which tend to be popular during times of depressed prices for gold, and low-grade, large-tonnage deposits, which generally become more profitable when gold prices are higher. The average price of gold in 2004 was $410 per ounce, well above prices in 2003 and 2002, $363 and $310 per ounce, respectively. New discoveries were reported along the Carlin trend, in the Jerritt Canyon District, along the Battle Mountain-Cortez-Eureka trend, and in several other districts. Barrick added 71,500 kilograms (kg) of gold to its reserves at the Betze-Post Mine, and Newmont added 71,500 kg of gold to its reserves at the Phoenix Project in the Battle Mountain District. Extensions of mineralization were also discovered near the Marigold, Pinson, Sleeper, Hycroft, and Hog Ranch Mines. Exploration has taken place in many greenfield areas as well as in many of Nevada's famous mining districts. By concentrating on a gold deposit that Hecla Mining Co. planned to mine with underground techniques, the company avoided archaeological resources near its Hollister project in Elko County. Interestingly, these resources (chalcedony, used for stone tools) probably were formed by the same hydrothermal system that deposited the gold.

Most exploration efforts focused on gold and silver, but strong prices stimulated exploration for several other mineral commodities, including copper, molybdenum, and zinc. As measured by the numbers of active claims on public lands, grass-roots exploration activity rose significantly during the year. According to the Nevada Division of Minerals Nevada Exploration Survey, exploration activity in Nevada has been steadily increasing since 2001, when companies reported $51.2 million in expenditures in Nevada (Driesner and Coyner, 2005b§). The 22 companies responding to the survey reported spending $79.7 million on exploration in Nevada in 2004. This figure was well below the level of $138.8 million in 1995, but the companies were optimistic about Nevada's potential and project spending $111.9 million in 2005. Another measure of exploration activity was the number of exploration geologists employed by these companies—124 in 2004 compared with 126 in 2003. These companies projected employing 145 exploration geologists in 2005. Because of its favorable geology and regulatory climate, Nevada continued to attract a large portion of the worldwide exploration expenditures of the companies actively exploring in Nevada. Significant exploration (including drilling, geochemical sampling, geological mapping, and claim staking) was reported in all 17 Nevada counties. The number of active claims in Nevada rose substantially in 2004 to about 120 from about 90 in 2003, but was still close to the relatively low level reached in 1993 after the introduction of new fees by the Federal Government.

Commodity Review

Industrial Minerals

Barite.—Nevada produced nearly all the barite mined in the United States. About 508,000 metric tons (t) of barite was produced in the State in 2004, 15% more than was produced in 2003. About 95% of the barite sold in the United States was used as a weighting agent in oil-and gas-well-drilling fluids. In September 2004, the total domestic drill rig count rose to 1,250 rigs from 1,090 rigs in 2003. According to the USGS, the country imported 2.0 million metric tons (Mt) of barite in 2004, up from 1.65 Mt imported in 2003. Most of the imported barite came from China. Nevada barite was mostly sold into Colorado and Wyoming for gas drilling, which increased in 2004. Nevada producers were also competitive in California and Canada in 2004.

M.I. Drilling Fluids (jointly owned by Smith International and Schlumberger Ltd.) was the largest Nevada barite producer in 2004, with combined production of about 290,000 t of screened and crushed high-grade ore from the Greystone Mine and ground and bagged barite from its Battle Mountain plant, both in Lander County. The company was reportedly evaluating barite deposits elsewhere in Nevada, particularly in the Lone Mountain area in Elko County in 2003.

Baroid Drilling Fluids (a subsidiary of Halliburton Co.) was the second largest producer in Nevada in 2004. The company mined barite from the Rossi Mine in Elko County and processed it at the Dunphy Mill in Eureka County. Baker Hughes INTEQ also produced a significant amount of barite from its Argenta property near Battle Mountain, in Lander County. Standard Industrial Minerals shipped a small amount of barite from a deposit of white, paint-grade barite at the P and S Mine in Nye County to a processing plant in Bishop, California.

Boron.—American Borate Co. processed borate minerals at the Lathrop Wells mill in Nye County from a mine in Death Valley, CA, which has a 20,000-metric-ton-per-year (t/yr) (B_2O_3 basis) capacity. This production was not included in the estimate of total value of Nevada minerals because the ore was from out of State.

Cement.—Based on USGS data, in 2004, about 95 Mt of cement was produced in the United States at an average mill price of about $85 per metric ton. The only major Nevada producer is the Nevada Cement Co. (part of Texas-based Eagle Materials Inc.) in Fernley, Lyon County. The NBMG estimated the company's cement production capacity to be about 540,000 t/yr. The cement was manufactured from Tertiary lacustrine limestone mined a few kilometers south of Fernley, and other ingredients came from northern Nevada. The deposit near Fernley had limited reserves, and Nevada Cement was drilling limestone of the Natchez Pass Formation in its Echo Canyon Claim Group in the Humboldt Range of Pershing County. The

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limestone was evaluated as a raw material for possible use in a new cement plant on mill site claims near the Rye Patch exit on Interstate 80.

Limestone suitable for cement production is widespread near Las Vegas, and several attempts have been made to initiate cement production in the area without long-term success. In 1999, Royal Cement Co. restarted an idle cement plant near Logandale.

In July 2004, Ash Grove Cement Co., a Kansas firm, announced an agreement with the Moapa Band of Paiute Indians to build a 1.4 million-metric-ton-per-year-capacity cement plant on the Moapa reservation northeast of Las Vegas; the cement would be quarried from a site on the east flank of the Arrow Canyon Range near the western border of the reservation. The mine site would include approximately 530 hectares (ha) in Sections 5-8, T16S, and R64E. The limestone would be crushed and delivered by belt conveyor to the proposed cement plant east of the mine near the Union Pacific Railroad. The rock was considered to be relatively pure Devonian limestone and to be part of the same Sultan Formation unit that was quarried for lime manufacture at Apex, which is about 24 kilometers (km) to the southwest. Other materials used in the cement manufacturing process (mainly alumina, clay, coal, gypsum, iron, and silica) would be delivered by truck or rail, or if found to be available on the reservation, could be mined under separate agreements. In addition to land and water payments, as well as limestone royalties, Ash Grove would pay substantial tribal taxes. Construction of the plant, which was projected to cost $250 million, was expected to begin in early 2006, with completion projected by late 2007 or early 2008. Ash Grove operated nine U.S. cement plants, but the Moapa facility would be the company's first plant in the Southwest. Also in 2004, Cementos Pacasmayo, a large Peruvian cement company, decided not to pursue plans, previously announced, to build a cement plant in the Las Vegas area.

Clays.—Nevada clay production was estimated to be 33,000 t in 2004, about the same as that of 2003. This does not include clay mined in Washoe County for Nevada Cement (which is included in the cement figure). IMV Nevada (owned by Mud Camp Mining Company, LLC) produced more than 29,000 t of bentonite, saponite, and sepiolite from deposits in lacustrine sediments in the Ash Meadows-Amargosa Flat area of Nye County. The clay occurs in shallow, flat-lying deposits in Pliocene lacustrine rocks. It was processed at a plant in Amargosa Valley, and clay products were exported worldwide. The saponite and sepiolite deposits were unusual, and were considered to have originated in a Pliocene playa with an area of at least 5,700 ha. The sepiolite, which yields most of the profits for the operation, occurs in an almost continuous bed with an average thickness of about 2 meters (m). Sepiolite is rare in playa sediments elsewhere in the western United States, but these other occurrences have not been of economic importance. Two companies mined and shipped relatively minor amounts of Nevada clay from several sites on an irregular basis for use in high-cost specialty products. At its White Caps Mill near Beatty in Nye County, Vanderbilt Minerals Co. processed small amounts of clay stockpiled from several Arizona, California, and Nevada deposits. In 2004, the company shipped stockpiled clay from the New Discovery Mine near Beatty, the Blanco Mine in Esmeralda County, and the Buff and Satin Mines in Pershing County. The American Colloid Co. mined white bentonite from Coal Canyon in Pershing County and hectorite from the Disaster Peak Mine in Humboldt County. The clays were shipped to the American Colloid plant in South Dakota, where they were blended into specialty clay products. Art Wilson Company mined clay sporadically from the Jupiter Mine near Wabuska in Lyon County: the clay is mostly used as pond liner. Specialty Clays Corporation has been evaluating a deposit of bentonite in Churchill County about 16 km southeast of Fallon. This bentonite was reported to have expansive qualities similar to that of Wyoming bentonite.

In 1999, Oil-Dri Corp., the world's leading manufacturer of cat litter, announced the discovery of a large calcium montmorillonite deposit in Hungry Valley north of Reno. The clay, considered to be excellent for making clumping cat litter, occurs as an extensive, near-surface deposit of clay-rich strata as much as 30 m thick. In 2001, U.S. Bureau of Land Management (BLM) issued a final environmental impact statement for a clay mine and plant with a capacity of 180,000 t/yr. In 2002, Washoe County denied operating permits on the basis of local opposition to the plan, and the decision was in litigation. Oil-Dri also held the Capricorn clay deposit in northern Washoe County, which was also considered to contain good cat litter material but to be too remote to be competitive.

Nevada Cement Co. staked 12 placer claims in the Terraced Hills north of Pyramid Lake in 2004. The claims were staked near the company's clay mine, where halloysite was mined as a source of alumina in portland cement that is manufactured in the Fernley Plant about 80 km to the southwest.

Crushed Stone and Sand and Gravel.—Nevada's construction crushed stone, sand and gravel (aggregate) production was estimated to be 36 Mt, 2 Mt more than production for 2003. This production had an approximate value of $180 million, well below that of gold but higher than that of any other of the State's mined commodities. Aggregate production from sand and gravel deposits accounted for about 65% of aggregate production statewide, with crushed stone and lightweight aggregate making up the balance.

Construction aggregate produced in the Las Vegas area in 2004, estimated to be 27 Mt, which was 3 Mt higher than that of 2003. Las Vegas topped the University of Central Florida's Private Construction Intensity Index for domestic metropolitan areas every year since 1999. In the first 5 months of 2004, more than 3,400 Las Vegas area new home construction permits were issued monthly, compared with about 2,000 per month in the same period in 2003. The boom in new home construction, along with attendant infrastructure construction and tourist destination building, has maintained local demand for construction aggregate at high levels.

Sand and gravel operations accounted for about 70% of the aggregate used in the Las Vegas metropolitan area in 2004, with crushed stone and lightweight aggregate making up the balance. The most important source of sand and gravel aggregate for Las Vegas is the Lone Mountain area northwest of Las Vegas, which accounted for more than 7 Mt in 2004. Significant production also came from sand and gravel pits in the southwest part of Las

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Vegas. Since the mid-1990s, portable crushers that produced aggregate from sand and gravel at construction sites have been important producers of base aggregate in Las Vegas, although this production may have fallen off in 2004. Crushed stone, mostly crushed carbonate rock mined from outlying areas has gained importance in the Las Vegas construction aggregate market in recent years, particularly for concrete aggregate.

Companies in the Las Vegas area that produced more than 900,000 t/yr of aggregate in 2004 were Nevada Ready Mix Corp., Las Vegas Paving Corp., Frehner Construction Co., and Rinker Materials Corp. Companies with production in excess of 450,000 t/yr were American Sand and Gravel LLC, Granite Construction Inc., American Asphalt & Grading Co., Wells Cargo Inc., and Hollywood Gravel Co.

Nevada Ready Mix mined all of its aggregate from a complex of pits in alluvium in the Lone Mountain area; minor production also came from adjacent bedrock. Las Vegas Paving Corp. produced sand and gravel from its Blue Diamond and Lone Mountain pits and portable crushing operations. The company also produced crushed stone from the Apex landfill about 16 km northeast of Las Vegas. Rinker Materials (a subsidiary of the Australian-based CSR Group) produced sand and gravel from its Buffalo Road pit and crushed granite from the El Dorado pit near Railroad Pass. Frehner Construction (a subsidiary of Aggregate Industries of England) mined and crushed limestone from its Sloan property a few kilometers south of Las Vegas. Community pits and other aggregate mining facilities administered by BLM and operated by several companies contributed more than 6 Mt to the Las Vegas area total in 2004. The Southern Nevada Lightweight operation near Jean mainly produced aggregate for lightweight concrete block and sand for use in stucco. Lightweight aggregate was also shipped into the Las Vegas market from a cinder operation near Amargosa Valley in Nye County by Cind-R-Lite Block Company.

Most Las Vegas area aggregate is mined from private property; however, some is produced as a salable commodity from BLM community pits. Lode claims continued to be held on carbonate rock resources that may be used for aggregate in the Las Vegas area. This process was initiated in 2001 when Rinker Materials Inc. acquired claims on carbonate rock in the Sloan area south of Las Vegas. In 2004, BLM completed a Mining Claim Validity Report on these claims, which included comparative testing of materials from the claims with similar material from producers of crushed carbonate rock in the Las Vegas area. On the basis of this report, a hearing in Federal court was scheduled for early 2005. Finalization of judgment and appeal on this matter may take years. Companies that held claims on carbonate rock or other aggregate material in the Las Vegas area in 2004 included Frehner Construction Co. in the Sloan area, Sierra Ready Mix and Diamond Generating Corp. in the Ivanpah area about 32 km south of Las Vegas, and Las Vegas Paving in the Dry Lake area northeast of Las Vegas. Other companies may have staked aggregate resources in the Las Vegas area by proxy. Production of construction aggregate in the Reno-Sparks-Carson City area, at about 6 Mt, climbed 20% higher than that of 2003. Companies in the area that produced more than 900,000 t of aggregate were Granite Construction Co., RMC Nevada Inc., Martin Marietta Materials Inc., and Rilite Aggregate. Granite Construction produced aggregate from five pits in the area. RMC Nevada, part of a United Kingdom group, owned the former All-Lite Aggregate and Paiute Pit Aggregates operations. Most of Martin Marietta's production came from the Rocky Ridge Quarry north of Sparks. Frehner Construction and A&K Earthmovers, Inc. was also an important producer. Crushed rock, which accounted for about 65% of the aggregate used in 2004 in the Reno-Sparks-Carson City area, included material from Martin Marietta Materials, Granite Construction, and Frehner operations and lightweight rhyolite aggregate from RMC Nevada, Rilite, and Naturalite Aggregate Corp.

Aggregate that was produced outside of the major metropolitan areas in 2004 was estimated at about 3 Mt. Lincoln County producers shipped more than 450,000 t of aggregate mostly into the Las Vegas market. Operators in Nye County together produced more than 450,000 t of aggregate in 2004 mostly in the Pahrump area. Elko, Churchill, and Lyon Counties each produced more than 180,000 t of aggregate; much of the Lyon County material was sold into the Reno-Carson City metropolitan area. Storey and Humboldt County each produced more than 90,000 t of aggregate; other rural Nevada counties are estimated to have produced less than 90,000 t of aggregate each in 2004.

Diatomite.—Diatomite production in Nevada, which accounted for more than 30% of domestic production, was virtually unchanged from 2003 to 2004. About two-thirds of the diatomite produced was used in filtration, with the remainder largely used in absorbents, fillers, and cement. Emerging small-scale uses included pharmaceutical processing and nontoxic insecticides. According to the USGS, the average domestic price in 2004 was about $286 per metric ton free on board (f.o.b.) plant. EaglePicher Filtration and Minerals, Inc. (a division of EaglePicher, Inc.) produced most of Nevada's diatomite at three different locations in 2004. The company's Colado operation in Pershing County proved the most productive. It consisted of a plant at Lovelock that mostly made filtration products and diatomite mines about 24 km northwest of Lovelock. The company also produced diatomite used in fillers and absorbents at its Clark plant and mine in Storey County about 32 km east of Reno and diatomite used in insulation from a pit near Hazen in Lyon County. EaglePicher (a wholly owned subsidiary of Granaria Holdings, B.V. of the Netherlands) was reportedly for sale. Moltan Co. of Tennessee produced absorbent products, cat litter, and soil conditioner at a mine and plant complex in Churchill County about 32 km northeast of Fernley. The diatomite resource was reported to contain 100 years of reserves. Moltan shipped diatomaceous earth absorbents under several labels. The Celite Corp. (a subsidiary of World Minerals Inc. with a large diatomite facility in California) recently acquired the CR Minerals Mine at Hazen and plant in Fernley, which produced functional filler. The Grefco diatomite operation near the Esmeralda/Mineral County line was small relative to other Nevada diatomite producers. American Diatomite Inc., which staked four claims in 2003 in the Monte Cristo Range in Esmeralda County about 16 km north of Coaldale, staked another 24 claims in the same area in 2004. The claims were in the vicinity of the Shu Fly diatomite deposit.

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Dimension Stone.—Nevada was not well known as a producer of dimension stone, and high-quality, cut and polished products were not produced from stone mined in the State. However, split dimension stone products were produced at two localities in Nevada, new dimension stone operations were being evaluated, and oversize stone blocks were used in wall construction. Las Vegas Rock produced flagstone, ashlar, boulders, and crushed landscape rock from its Rainbow Quarries near Goodsprings about 32 km southwest of Las Vegas. The stone was quartz-cemented sandstone that is part of the Jurassic Aztec Sandstone, which crops out extensively in Clark County, but is generally too friable for building stone. Mt. Moriah Stone quarried flaggy, light-gray quartzite from the Cambrian Prospect Mountain Quartzite about 24 km north of Baker in White Pine County. This material, which naturally splits into slabs up to 1.5 m by 2.4 m by 10 centimeters thick, was used for flagstone and other types of uncut building stone. The company typically operates from April to December each year.

Gemstones.—Precious opal has been produced from the Virgin Valley District in Humboldt County since its discovery in the early 20th century and is mined today by several small operations. The best known of these operators were the Royal Peacock, Rainbow Ridge, Bonanza, and Hidden Valley Mines. Much of the opal came from pay-to-dig operations and was unreported. Eight individuals and groups staked a total of 43 claims in the Virgin Valley District in 2004. The largest 2004 claim group is the 29-claim WRT Rainbow Ridge Opal et al Group staked by the Wentzell Revocable Trust.

Turquoise has come from many Nevada locations in the past, but no turquoise production was reported in 2004, although turquoise and the related gemstone faustite were mined from one site in 2003.

Gypsum.—In 2004, gypsum production in Nevada was an estimated 1.9 Mt, about 10% more than that of 2003. The three largest Nevada producers, PABCO Gypsum, BPB PLC, and USG Corp., used most of this gypsum in local wallboard plants.

PABCO Gypsum in Clark County northeast of Las Vegas mined and processed about 1 Mt of gypsum ore in 2004. The total gypsum production figure reported here reflects the 70% recovery from this deposit. Although processing yields only about 70% by weight gypsum from the ore, the company still ranks as the largest producer in Nevada. The gypsum, which is in a nearly flat-lying gypsite blanket in excess of 37 m thick in places, occurs atop a 1,300 ha mesa.

The Blue Diamond operation of BPB PLC southwest of Las Vegas in Clark County was the second largest producer with about 662,000 t. The gypsum deposit is the largest of several Permian deposits in the Las Vegas area. It consists of more or less flat-lying beds of pure gypsum as much as 9 m thick on a table mountain that overlooks the city. The Blue Diamond area has been the site of gypsum mining since 1925, but is in the path of metropolitan growth in 2004, and gypsum mining there was scheduled to cease in 2005 to make way for an upscale housing development. The adjacent BPB wallboard plant planned to continue to operate on gypsum imported from southern Utah.

USG, the Nation's leading wallboard producer, was the third leading Nevada producer in 2004 at about 322,000 t. The company mined gypsum in western Pershing County and processed it into wallboard and plaster at a plant at Empire in Washoe County. The gypsum is of Triassic or Jurassic age and forms several masses in a 520-ha area. The largest mass, the Selenite ore body, contained 85% to 95% gypsum and was generally well bedded with variable dips.

The Art Wilson Company of Carson City shipped anhydrite and gypsum from the Adams Mine in Lyon County, and the D.L. Denman Construction Company mined gypsum at the Pioneer Mine about 16 km east of Las Vegas. Material from these relatively small operations was used in agricultural and cement applications. The Adams deposit is a folded, diapiric mass associated with limestone in Triassic metavolcanic rocks. The Pioneer Mine is in the same gypsite deposit as the PABCO operation about 8 km to the north.

Lime, Limestone, and Dolomite.—In 1997, lime supplanted diatomite as Nevada's second most valuable industrial mineral. Limestone was mined for lime production at two sites in Nevada that are nearly at opposite ends of the State; however, the high-calcium limestone that is used at both sites is from the same Devonian limestone unit (although it is assigned to different stratigraphic formations). In addition to lime, relatively minor amounts of crushed limestone were also shipped from both sites, and dolomite was mined at one of the sites.

The Pilot Peak high-calcium lime operation of Graymont Western US, Inc. (formerly Continental Lime, Inc.) 16 km northwest of Wendover in Elko County, was Nevada's leading producer, mainly marketing lime to gold-mining operations for use in cyanide-solution pH control. The Pilot Peak plant has three kilns with a combined capacity of more than 635,000 t/yr of quicklime and a hydrated lime plant capable of producing 318 metric tons per day. In 2000, the Pilot Peak plant was rated the ninth ranking producer in the country.

Chemical Lime Co. produced lime at Apex about 32 km northeast of Las Vegas. The Apex operation made high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets, and also produced hydrated lime that was mainly used in construction. The Chemical Lime dolomite quarry at Sloan ceased operating in 1997, but in 2004, the company's Henderson plant processed dolomitic quicklime from Apex into Type S hydrated lime for construction uses. In addition to lime, Graymont Western U.S. and Chemical Lime shipped crushed limestone. Other carbonate rock producers in Nevada were Min-Ad, Inc. and Nutritional Additives Corp., producers of agricultural and nutritional dolomite products near Winnemucca. Columbus S.M. LLC, a small California-based company, was evaluating the production of calcium carbonate and magnesium hydroxide from the Columbus Salt Marsh in Esmeralda County. The company planned to leach the commodities from material mined from the playa and to market the calcium carbonate as a food additive.

Lithium.—Chemetall Foote Corp. (a subsidiary of Chemetall GmbH) produced lithium carbonate, lithium hydroxide anhydrite, and lithium hydroxide monohydrate at Silver Peak in Esmeralda County. This operation, the only primary lithium producer in the United States, produced these chemicals from brine that was pumped from beneath Clayton Valley playa, where 50 production wells as deep as 350 m tap

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6 stratigraphically and structurally controlled aquifer systems. Lithium preconcentration was carried out in evaporation ponds that covered more than 1,600 ha. Production figures were company proprietary; the most recent public information, from 1998 Securities and Exchange Commission data, reported annual production of about 5,400 t of lithium carbonate and 2,300 t of lithium hydroxide. Lithium carbonate was the main feedstock for major uses of the element in aluminum production, batteries, ceramics, glass, and lubricants. Lithium use in rechargeable batteries was a rapidly expanding market.

Magnesium Compounds.—Premier Chemicals LLC of Cleveland, OH, owned the Gabbs magnesia operation in Nye County, the only magnesite mine in the United States. Brucite was recovered as a byproduct.

During the 1990s, the availability of cheap foreign refractory magnesia caused production at Gabbs to be switched to light-burned (caustic) magnesia that is mainly marketed for wastewater treatment and agricultural uses. Although production of magnesia at Gabbs was still substantially below its peak in 1981, magnesia shipments from the Gabbs operation have increased steadily since 1996.

The Gabbs brucite, which was shipped in relatively small amounts, was mainly sold as a byproduct mined from pods in magnesite pits. Magnesite and brucite at Gabbs occur over an area of about 520 ha in complex replacement bodies in Triassic dolomite, and the remaining resource is very large.

Perlite.—Although the United States was the second leading producer of perlite, domestic perlite production suffered transportation cost disadvantages in the eastern United States compared with perlite from Greece, which ranked first in the world in perlite production. Prior to 2004, domestic production had slipped for 4 years in a row while imports increased; this trend ended in 2004 with a decrease in perlite imports of more than 25%. Perlite is mined in eight western States, led by New Mexico. Nevada has large perlite resources, and several deposits of perlite were mined extensively in the past. Historically, the leading producer was the Hollinger Mine near Pioche in Lincoln County. Current perlite production in Nevada was restricted to relatively small-scale mining of two deposits for niche markets, and the State produced less than 1% of the domestic total in 2004.

Wilkin Mining and Trucking Inc. mined perlite from the Tenacity Perlite Mine about 40 km west of Caliente in Lincoln County. The company had been mining perlite in the area for more than 25 years. In the past, most of the perlite was shipped as crude; however, the company recently opened a small popping plant in Caliente, and present sales of 1,400 to 1,800 t/yr of expanded perlite was sold mostly to horticultural markets. In 2003, the company filed a plan to mine perlite from the Sunny Mine, which is near the Hollinger Mine in the Wilson Creek Range northeast of Pioche.

EaglePicher Minerals produced expanded perlite at its Colado diatomite plant in Pershing County from perlite mined at the Popcorn Mine about 24 km south of Fallon in Churchill County. The perlite was marketed as a filter aid, and plant capacity was reportedly about 7,300 t/yr.

Salt.—The Huck Salt Company produced about 12,700 t of salt in 2004, up 55% from 2003. Because the salt was mainly used for deicing roads, production levels were dependent on weather. The heavy winter of 2004-05 sent production higher. The salt came from a playa in Fourmile Flat about 40 km southeast of Fallon in Churchill County, where it has been harvested almost continuously since the 1860s when it was hauled to the mills that processed Comstock silver and gold ore.

Silica.—The United States was by far the world's leading producer of silica sand in 2004. Annual domestic production had hovered nearly 28 Mt for the past 9 years. In 2004, Simplot Silica Products at Overton in Clark County shipped about 680,000 t of silica sand, 10% more than 2003 shipments. The sand was mined from an open pit 2.4 km long and 91 m deep in the relatively friable Cretaceous Baseline Sandstone, washed in the pit, and transported via a 8-km slurry pipeline to a plant where it is screened and bagged. Silica sand had been produced from the deposit since the 1930s; Simplot acquired the operation in 1955.

American Cement and Aggregate produced silica sand from the Silica LLC pit near Mercury in Nye County. A plan of operations submitted to the BLM in 2001 called for annual production of as much as 73,000 t. The silica-rich rock mined was the Ordovician Eureka Quartzite. The quartzite was crushed, sieved, and bagged in several sizes and sold mostly as stucco sand; however, the product was relatively pure at more than 98% SiO_2, and the company was seeking other markets.

James Hardie Building Materials Inc., an Australian company, staked eight claims about 3 km south of Golconda in Humboldt County on a probable silica deposit in the Prospect Mountain Quartzite. The company, which once mined gypsum and made wallboard near Las Vegas, manufactured highly durable fiber-cement building materials. It opened a siding manufacturing plant in Reno in late 2004 and was exploring for raw materials. The company also staked small claim groups in the vicinity of the Stone Corral Silica Mine in Humboldt County about 16 km north of Golconda and in the vicinity of the Lucky Boy silica property in Mineral County.

Vermiculite.—In 2004, IBI Corp., a junior international mining and investment company, through its subsidiary North American Vermiculite Inc., was scheduled to evaluate unpatented claims near Mica Peak in Clark County for vermiculite deposits. Minor amounts of vermiculite were mined from a deposit in the area in the 1940s, and Oglebay Norton leased the property in the 1980s. The ore, which consists of altered ultramafic rock, has been described as containing 20% to 35% of good to superior exfoliating vermiculite.

Zeolites.—Nevada contains several large zeolite deposits that were discovered and evaluated during a flurry of zeolite exploration activity in the 1950s and 1960s; however, natural zeolite production never evolved into a major industry in the State. Ash Meadows Zeolite LLC (a subsidiary of Badger Mining Corp.) shipped 900 to 4,000 t/yr of clinoptilolite used in water filtration, odor control, and nuclear cleanup from a plant in Amargosa Valley in Nye County. The clinoptilolite was mined from a deposit of white zeolitized tuff in California, but the company also holds nearby claims in Nevada underlain by green zeolite that has been mined in the past.

Moltan Company mined chabazite and mordenite from a deposit in the Trinity Range in Churchill County about 64

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km northeast of Fernley. The company used the mineral in absorbents that were produced at its Fernley plant.

Metals

Gold and Silver.—Nevada produced 216,000 kg gold and 323,000 kg of silver in 2004. Gold production was down by about 9,600 kg compared with that of 2003, but silver production increased by about 22,000 kg. Nevada maintained its place as the leading producer of gold in the United States but was second to Alaska in silver production. Twenty-five mines in Nevada reported gold production in 2004, while 20 reported silver production. Newmont Mining Corp., reported production from its Carlin trend mines and the Twin Creeks, Lone Tree, Mule Canyon, Phoenix, McCoy/Cove, and Midas Mines (plus its 25% share of the Turquoise Ridge Joint Venture), and had a total Nevada production of 75,200 kg of gold, making it the leading producer for 2004. Barrick Gold Corp., with production from its Betze-Post, Meikle, and Ruby Hill Mines (plus its 50% share of Round Mountain's production and 33% share of Marigold's production) had a total production of 73,900 kg of gold. For the fifth consecutive year, Barrick Gold's Betze-Post Mine was Nevada's most productive gold mine, with an output of 43,000 kg. Newmont's Carlin trend mines produced 35,200 kg of gold, and Placer Dome's Cortez operations produced 32,700 kg of gold. Barrick's Meikle Mine, the leading underground mine in Nevada, produced 17,500 kg of gold in 2004, almost 310 kg more than that of 2003.

Coeur d'Alene Mines Corp.'s Rochester Mine maintained its place as the leading silver mine in Nevada in 2004 with a production of 174,000 kg. Newmont's Midas Mine held second place with 67,900 kg of silver, and the Round Mountain Mine followed in third place with 24,100 kg.

Much of Nevada's silver production in 2004 was a coproduct or byproduct of gold mining. With a ratio of value (average price of gold to average price of silver) of 63:1 in 2004, only those deposits with more than 63 times as much silver as gold can be considered primary silver deposits. Only one such deposit was mined in Nevada in 2004—the Coeur Rochester Mine in Pershing County (with a silver to gold production of 82:1 and total silver production of 174,000 kg). This one mine produced 55% of Nevada's silver in 2004. The mine also reached a significant milestone in 2004—cumulative production of 100 million troy ounces or more than 3 million kilograms of silver.

Barrick's Betze-Post Mine in Eureka County produced 43,000 kg, making it the leading gold mine in the State, and Barrick's Meikle Mine in Elko County produced 17,500 kg making it the leading underground producer in 2004. Barrick's overall gold production in the State in 2004, including its portion of joint ventures, totaled 73,900 kg, slightly less than Newmont's overall production of 75,200 kg from several mines, including one joint venture, Newmont's production on the Carlin trend, including its Carlin operations and Capstone/Bootstrap and Rain Mines, totaled 40,100 kg. Placer Dome's Cortez operation (Pipeline and nearby deposits in Crescent Valley, Lander County) produced 32,700 kg of gold in 2004. One new gold mine (Apollo Gold's Standard Mine in Pershing County) opened in 2004, and Quadra Mining Ltd. reopened the Robinson copper-gold mine near Ely in White Pine County.

As mentioned earlier in this chapter, mercury was produced as a byproduct of gold-silver processing but data were not available.

Government Programs

Through a survey conducted early in 2005, the Nevada Division of Minerals collected data for Nevada Bureau of Mines and Geology Special Publication P-16, Major Mines of Nevada 2004 (Driesner and Coyner, 2005a§). This publication includes, in handbook form, location maps, names and telephone numbers of operators, numbers of employees, and nonproprietary production figures for most mines in Nevada. It also contains a section on economic impacts of the industry. This 28-page publication was available for free on the Internet at http://www.nbmg.unr.edu.

Additional information about the Nevada mineral industry and the U.S. gold industry, including the contents of selected publications, was available from the Nevada Bureau of Mines and Geology Web site at http://www.nbmg.unr.edu/ and the Nevada Division of Minerals Web site at http://minerals.state.nv.us/. Useful national and international data on nonfuel minerals can be obtained from the USGS Web site at http://minerals.usgs.gov/minerals/, and the U.S. Energy Information Administration Web site at http://www.eia.doe.gov/ provides data on oil and gas, geothermal, and other energy sources.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEVADA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays:							
Bentonite		6	W	6	817	7	W
Fuller's earth		28	3,870	28	3,870	W	W
Gold[3]	kilograms	240,000	2,410,000	227,000	2,660,000	216,000	2,850,000
Sand and gravel:							
Construction		35,400	159,000	37,100	174,000	43,100	197,000
Industrial		615	11,000	W	W	W	W
Silver[3]	kilograms	424,000	63,000	322,000	50,900	302,000	65,000
Stone, crushed		8,010	41,900	7,830	48,500	9,760	72,800
Combined values of barite, brucite, cement (portland), clays (kaolin), copper (2004), diatomite, gemstones, gypsum (crude), lead (2002), lime, lithium carbonate, magnesite, perlite (crude), salt, zeolites (2004), and values indicated by symbol W		XX	228,000	XX	252,000	XX	286,000
Total		XX	2,910,000	XX	3,190,000	XX	3,470,000

W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.

TABLE 2
NEVADA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4	3,760	$16,600	$4.41	4	3,800	$14,700	$3.88	5	4,330	$29,900	$6.92
Dolomite	4	W	W	4.72	3	W	W	93.38	3	W	W	96.06
Granite	4	W	W	4.78	4	W	W	5.87	3	W	W	5.87
Traprock	3	84	388	4.63	3	84	388	4.63	--	--	--	--
Volcanic cinder and scoria	2	W	W	7.68	2	W	W	6.39	2	W	W	6.54
Miscellaneous stone	4	1,350	10,700	7.94	4	945	9,320	9.86	3	968	9,200	9.49
Total or average	XX	8,010	41,900	5.23	XX	7,830	48,500	6.20	XX	9,760	72,800	7.46

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

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TABLE 3a

NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate, graded:			
Concrete aggregate (coarse)	710	$4,320	$6.08
Bituminous surface treatment aggregate	W	W	4.63
Fine aggregate (-⅜ inch), stone sand, concrete	W	W	7.62
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	2.96
Unpaved road surfacing	(2)	(2)	4.78
Crusher run, select material or fill	(2)	(2)	3.55
Other coarse or fine aggregate	172	1,270	7.39
Total or average	250	1,510	6.04
Agricultural limestone	W	W	94.52
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	4.73
Lime manufacture	(2)	(2)	3.64
Total or average	1,820	7,330	4.03
Special, mine dusting or acid water treatment	W	W	5.84
Unspecified[3]			
Reported	1,370	6,630	4.84
Estimated	3,000	18,000	5.93
Total or average	4,420	24,700	5.59
Grand total or average	7,830	48,500	6.20

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

TABLE 3b

NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), other coarse aggregate	W	W	$5.28
Coarse aggregate, graded, concrete aggregate (coarse)	W	W	13.90
Coarse and fine aggregates, other coarse and fine aggregates	W	W	14.45
Agricultural limestone	W	W	97.20
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	5.37
Lime manufacture	(2)	(2)	13.78
Sulfur oxide removal	(2)	(2)	6.61
Total or average	1,800	$19,300	10.72
Special, mine dusting or acid water treatment	W	W	2.67
Unspecified[3]			
Reported	2,830	16,700	5.89
Estimated	1,300	4,300	3.31
Total or average	4,120	20,900	5.08
Grand total or average	9,760	72,800	7.46

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND BY DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate graded[2]	W	W	W	W
Fine aggregate (-⅜ inches)[3]	--	--	W	W
Coarse and fine aggregate[4]	W	W	W	W
Agricultural[5]	W	W	--	--
Chemical and metallurgical[6]	W	W	W	W
Special[7]	--	--	W	W
Unspecified:[8]				
Reported	1,290	6,430	76	198
Estimated	430	2,600	2,600	15,000
Total	2,700	20,300	5,130	28,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes concrete aggregate (coarse) and bituminous surface treatment aggregrate.

[3]Includes stone sand (concrete).

[4]Includes crusher and (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[5]Includes agricultural limestone.

[6]Includes cement and lime manufacture.

[7]Includes mine dusting or acid water treatment.

[8]Reported and estimated production without a break down by end use.

TABLE 4b

NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND BY DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	2,460	13,200	646	3,200
Coarse aggregate graded[3]	--	--	82	1,140
Coarse and fine aggregate[4]	209	1,540	292	5,690
Agricultural[5]	78	7,580	--	--
Chemical and metallurgical[6]	647	3,480	1,150	15,800
Special[7]	--	--	79	211
Unspecified:[8]				
Reported	1,120	5,450	1,720	11,200
Estimated	--	--	1,300	4,300
Total	4,510	31,200	5,260	41,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes other coarse aggregate.

[3]Includes concrete aggregate (coarse).

[4]Includes other coarse and fine aggregates.

[5]Includes agricultural limestone.

[6]Includes cement and lime manufacture and sulfur oxide removal.

[7]Includes mine dusting or acid water treatment.

[8]Reported and estimated production without a break down by end use.

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TABLE 5a
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete products (blocks, bricks, pipe, decorative, etc.)	4,040	$27,300	$6.75
Plaster and gunite sands	322	5,040	15.64
Concrete products (blocks, bricks, pipe, decorative, etc.)	175	1,760	10.05
Asphaltic concrete aggregates and other bituminous mixtures	1,200	8,060	6.72
Road base and coverings[2]	4,760	19,900	4.19
Fill	2,000	8,560	4.29
Snow and ice control	27	130	4.81
Other miscellaneous uses[3]	827	2,500	3.03
Unspecified:[4]			
Reported	10,700	33,500	3.14
Estimated	13,000	67,000	5.14
Total or average	37,100	174,000	4.69

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete products (blocks, bricks, pipe, decorative, etc.)	3,210	$21,900	$6.85
Plaster and gunite sands	812	8,050	9.91
Asphaltic concrete aggregates and other bituminous mixtures	1,040	6,810	6.58
Road base and coverings[2]	7,550	29,100	3.85
Fill	1,920	7,630	3.98
Snow and ice control	57	284	4.96
Other miscellaneous uses[3]	1,690	6,110	3.62
Unspecified:[4]			
Reported	11,600	41,500	3.57
Estimated	15,000	75,000	4.93
Total or average	43,100	197,000	4.56

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes filtration.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	635	3,970	3,910	30,100	--	--
Asphaltic concrete aggregates and road base materials[3]	1,250	6,880	4,710	21,100	--	--
Fill	1,500	6,850	496	1,710	--	--
Other miscellaneous uses[4]	200	714	655	1,920	--	--
Unspecified:[5]						
Reported	1,100	5,490	4,290	19,300	5,270	8,710
Estimated	1,700	8,600	11,000	59,000	--	--
Total	6,330	32,500	25,500	133,000	5,270	8,710

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes railroad ballast and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

TABLE 6b
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	675	5,190	3,340	24,800	--	--
Asphaltic concrete aggregates and other bituminous mixtures	306	3,330	664	3,270	65	214
Road base and coverings[3]	1,160	5,740	6,360	23,300	39	86
Fill	1,490	6,230	424	1,400	--	--
Other miscellaneous uses[4]	684	1,920	1,060	4,470	--	--
Unspecified:[5]						
Reported	1,520	6,900	5,540	27,100	4,560	7,530
Estimated	1,900	9,500	13,000	66,000	--	--
Total	7,700	38,800	30,800	150,000	4,660	7,830

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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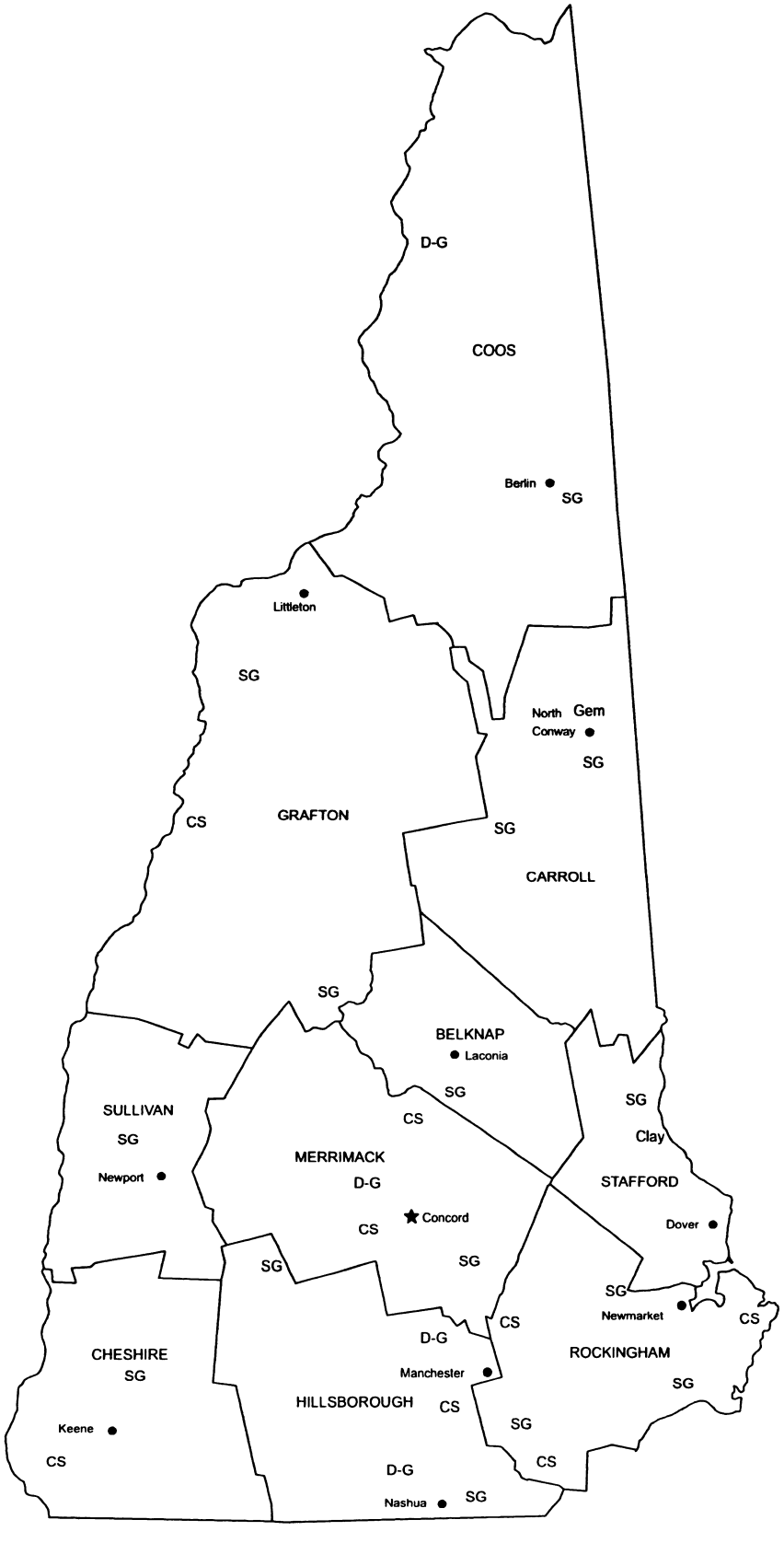
NEW HAMPSHIRE



LEGEND

County boundary

Capital

City

MINERAL SYMBOLS
(Major producing areas)

Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Gem	Gemstones
SG	Construction sand and gravel

0 20 Kilometers

Source: New Hampshire Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NEW HAMPSHIRE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Hampshire Geological Survey for collecting information on all nonfuel minerals.

In 2004, New Hampshire's nonfuel raw mineral production was valued[1] at $70.6 million, based upon annual U.S. Geological Survey (USGS) data. This was a 13% increase compared with that of 2003,[2] which was down 5.4% from 2002. Because data for dimension granite have been withheld (company proprietary data), the State's actual total nonfuel mineral values for 2002-04 are higher than those reported in table 1.

Construction sand and gravel, a high-volume, low-unit-value mineral commodity, remained New Hampshire's leading nonfuel mineral commodity in 2004, accounting for about 66% of its nonfuel raw mineral production value. Crushed stone was the State's second leading nonfuel mineral.

In 2004, construction sand and gravel and crushed stone production rose, the values of which were up $5.4 million and $2.6 million, respectively, accounting for all the State's increase in nonfuel mineral production value. Conversely, in 2003, decreases were in the production and values of both commodities—crushed stone value down $3.1 million and that of construction sand and gravel, down about $0.4 million—resulted in the State's decrease in total value from 2002 (table 1).

New Hampshire continued to be a producer of significant quantities of dimension stone in 2004 and was 15th among 34 dimension stone-producing States.

The following narrative information was provided by the New Hampshire Geological Survey[3] (NHGS).

Exploration

The public maintains a small but steady interest in panning for gold in northern New Hampshire. Exploration for economic deposits of crushed stone and sand and gravel continued in 2004.

Commodity Review

Industrial Minerals

Clays.—New Hampshire's extensive marine clays were not being used for other than as an ondemand local resource, such as borrow material for the base of land fills, ponds, and the core of dams. Some New Hampshire glacial tills, rich in silt and clay, are also used for these same purposes.

Dimension Stone.—The demand for New Hampshire's granite for use in landscaping continued strong in 2004. Granite for curbing was down slightly from that in 2003. The John Swenson Granite Works in Concord and the Fletcher Granite Company in Milford continued to be the State's major producers of dimension stone. Both quarries cut the Concord gray, two-mica granite. The Granite State had several other smaller, independent operations, also quarrying the Concord granite, which was used mostly for landscaping stone.

The Old Man of the Mountain, nicknamed the Great Stone Face or Profile, was located in Franconia Notch State Park. The Old Man of the Mountain was scenically set 366 meters above Profile Lake. Discovered in 1805, the rocks that made up the profile collapsed on May 3, 2003. Residents and tourists continued to mourn the loss of the New Hampshire State symbol—The Old Man of the Mountain. The New Hampshire State Geologist continued work with the Governor's Task Force, whose purpose was to examine ways to preserve the memory of the Old Man.

Gemstones.— Gemstones of amethyst, apatite, beryl, clear quartz, epidote, fluorite, garnet, smoky quartz, and topaz were the most common minerals collected. Again in 2004, commercial beryl and muscovite continued to be mined for resale by educational science supply houses. Most of these minerals are found in New Hampshire's abundant pegmatites.

Sand and Gravel.—Sand and gravel production increased from that of 2003. As the supply and access to good sand and gravel deposits decreased, there was a continued shift toward rock-base aggregates (crushed stone). Rock quarrying and crushing operations were able to supply the assortment of material sizes and blends as needed. Aggregate operations were faced with pressure from residents as to location and the effects of noise, dust, and heavy hauling. In spite of these factors, aggregate production in New Hampshire was up 3% since 2003. Cost for crushed stone and sand and gravel have risen slightly, mostly owing to the increase in the cost of fuel. New Hampshire aggregate was mainly used for asphalt, concrete, stone for rip-rap and drainage, roadway subgrade material, and general construction products. The future demand for these materials looked very promising.

Government Programs

The NHGS continued to be active in the STATEMAP Cooperative Geological Mapping Program. In 2004, under New Hampshire's STATEMAP Program, the surficial geology of four quadrangles—Hanover, West Alton, Parker Mountain, and Northwood—were mapped at the 1:24,000 scales.

NHGS is a cooperator with researchers at the University of New Hampshire's Jackson Estuarine Laboratory in a project

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Lee Wilder, Public Outreach Coordinator for the New Hampshire Geological Survey, authored the text of State mineral industry information provided by that agency.

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designed to compile data and map subsea terrain to better understand the surficial geology off of the New Hampshire coastline, and to map potential sand and gravel resources for potential beach replenishment. The project was funded by the U.S. Minerals Management Service.

The NHGS continued to answer public inquiries regarding the State's bedrock, general geology, ground water, minerals, and surficial materials. Geologic inquiries came in the form of e-mails, telephone calls, and personal visits. Outreach and education efforts include staff participation at classroom presentations, conferences, public lectures, and workshops. Publications on the minerals, bedrock, surficial geology, and ground water resources of New Hampshire can be obtained by contacting the Public Information Center of the Department of Environmental Services. A current listing of available publications can be accessed at URL http://www.des.state.nh.us/geo1link.htm.

Concern over having adequate quantities of quality ground water has become a problem with the continued increase in rural housing starts, the commercial demands for bottled water, and the needs of the mining industry. There was increased demand for New Hampshire's Geological Survey geologic mapping products for reliable aquifer information.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW HAMPSHIRE[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	6	NA	6	NA	6
Sand and gravel, construction	8,640	41,600	8,470	41,200	8,940	46,600
Stone:						
Crushed	4,810	24,500	4,110	21,400	4,750	24,000
Dimension, granite	W	(3)	W	(3)	W	(3)
Total	XX	66,100	XX	62,500	XX	70,600

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Granite	7	1,910	$8,890	$4.67	7	1,680	$7,920	$4.72	7	1,840	$8,750	$4.75
Traprock	8	2,910	15,600	5.36	8	2,430	13,500	5.54	8	2,900	15,200	5.25
Total or average	XX	4,810	24,500	5.08	XX	4,110	21,400	5.20	XX	4,750	24,000	5.06

XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$4.54
Filter stone	W	W	4.54
Coarse aggregate graded:			
Bituminous aggregate, coarse	W	W	9.09
Other graded coarse aggregate	W	W	4.54
Fine aggregate (-¾ inch):			
Stone sand, bituminous mix or seal	W	W	9.09
Screening, undesignated	W	W	4.54
Unspecified:[2]			
Reported	2,680	$12,200	4.54
Estimated	880	4,300	4.89
Total or average	4,110	21,400	5.20

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

TABLE 3b

NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$6.76
Filter stone	W	W	2.37
Coarse aggregate graded:			
Concrete aggregate, coarse	W	W	1.16
Bituminous aggregate, coarse	W	W	7.88
Railroad ballast	W	W	17.47
Other graded coarse aggregate	W	W	4.53
Fine aggregate (-¾ inch):			
Stone sand, concrete	W	W	17.61
Stone sand, bituminous mix or seal	W	W	6.61
Screening, undesignated	W	W	4.54
Coarse and fine aggregates, crusher run or fill or waste	W	W	7.99
Unspecified:[2]			
Reported	2,980	$13,500	4.52
Estimated	910	4,400	4.88
Total or average	4,750	24,000	5.06

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

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TABLE 4a
NEW HAMPSHIRE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	136	$1,230	$9.02
Asphaltic concrete aggregates and road base materials	636	3,730	5.87
Fill	468	2,530	5.41
Snow and ice control	78	399	5.12
Railroad ballast	4	32	8.00
Other miscellaneous uses[2]	111	799	7.20
Unspecified:[3]			
Reported	2,360	9,850	4.17
Estimated	4,700	23,000	4.83
Total or average	8,470	41,200	4.86

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes snow and ice control and railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

TABLE 4b
NEW HAMPSHIRE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	327	$2,630	$8.04
Asphaltic concrete aggregates and other bituminous mixtures	361	2,850	7.90
Road base and coverings	602	3,660	6.08
Fill	742	4,640	6.26
Snow and ice control	158	1,100	6.98
Other miscellaneous uses[2]	10	123	11.79
Unspecified:[3]			
Reported	2,530	11,300	4.47
Estimated	4,200	20,000	4.81
Total or average	8,940	46,600	5.21

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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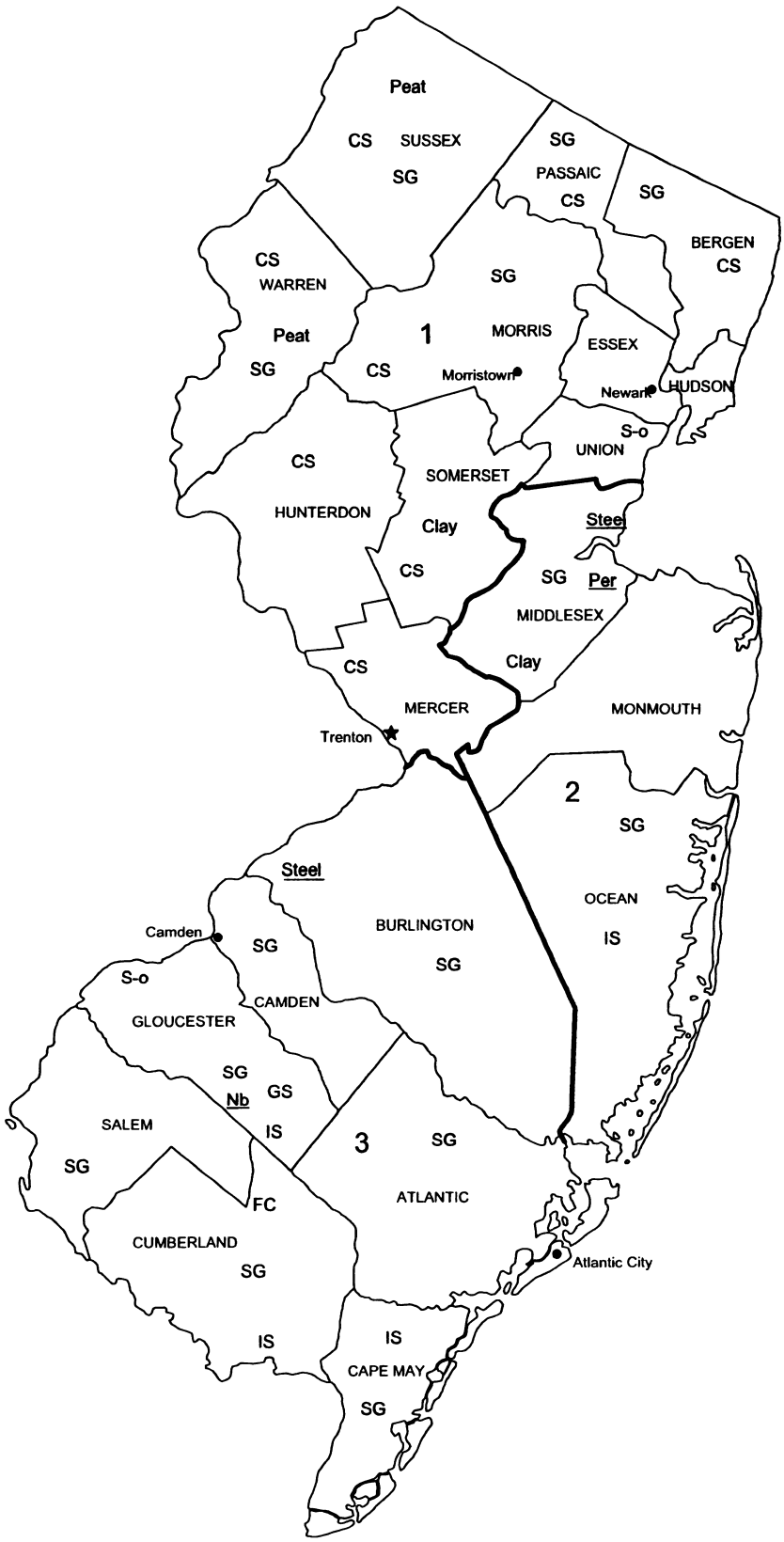
NEW JERSEY



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Clay	Common clay
CS	Crushed stone
FC	Fire clay
GS	Greensand
IS	Industrial sand
Nb	Columbium (niobium) plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant

0 20 Kilometers

Source: New Jersey Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NEW JERSEY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Jersey Geological Survey for collecting information on all nonfuel minerals.

In 2004, New Jersey's nonfuel raw mineral production was valued[1] at $341 million, based upon annual U.S. Geological Survey (USGS) data. This was a 6.2% increase compared with that of 2003,[2] which was up nearly 28% from 2002. Crushed stone and construction sand and gravel, by value, were New Jersey's leading nonfuel mineral commodities, followed by industrial sand and gravel and greensand marl.

In 2004, each of New Jersey's top three nonfuel minerals (based upon value) significantly contributed to the State's rise in value. A more than 10% increase in construction sand and gravel production generated a 14%, or $15 million, increase in the commodity's value from 2003. A relatively smaller increase in the production of crushed stone led to a $7 million rise in its value, while a nearly 29% increase in industrial sand and gravel production resulted in an increase in value of more than $3 million. Production and values of greensand marl, peat, and common clays increased (descending order of change) (table 1).

In 2003, a $61 million increase in the value of crushed stone led New Jersey's increase in total value, reversing a decrease of similar size that took place in 2002 ($66 million down from 2001). A nearly $9 million rise in construction sand and gravel value accounted for most of the balance of the State's increase for the year. Greensand marl production and value also showed relatively small increases (table 1).

In 2004, New Jersey continued to be the only State to produce greensand marl and rose to fourth from sixth in the quantity of industrial sand produced. Greensand marl was used directly as an organic conditioner and fertilizer for soils and as a water filtration medium to remove soluble iron and manganese from well water.

The following narrative information was provided by the New Jersey Geological Survey[3] (NJGS).

Exploration and Development

Mineral exploration activity for sand and gravel along New Jersey's Atlantic Coast was limited owing to environmental concerns and government regulations.

Commodity Review

Industrial Minerals

Mining activities in New Jersey were limited to production of crushed stone (traprock, granite, limestone, dolomite, and marble), construction sand and gravel, industrial sand, and to a lesser extent, the production of greensand marl, clay and peat (listings in order of quantity produced).

Demand for industrial minerals was strong because of the continuing construction boom and a particularly strong housing sector. The demand for new home construction remained very strong, with little sign of letting up at the end of 2004. Significant quantities of construction sand and gravel and crushed stone were produced at mining sites throughout the State. With no new pits or quarries opened during the year, it has become increasingly difficult to keep pace with demand. Rising real estate prices, environmental concerns, and government regulations pressured the industry to close many operations.

No significant mergers or takeovers in the mining sector took place during the year. Increasing demand for additional concrete capacity, however, stimulated some merger and acquisition interest at year end. The New Jersey Department of Transportation "Victory Bridge Project", between Sayreville and Perth Amboy, and several other large public works projects have tightened concrete supplies.

Offshore mining was limited to the sand derived from the maintenance dredging of the Ambrose Shipping Channel in Raritan Bay. Additional maintenance dredging projects were being evaluated by Federal officials and the Port Authority of New York and New Jersey.

Government Activities

The U.S. Army Corps of Engineers and the New Jersey Department of Environmental Protection remained committed to long-term beach replenishment projects along the Atlantic Coast. Most of the sand used came from sites within 5 kilometers of the coast. In support of this effort and also to identify offshore resources, the New Jersey Geological Survey entered into its 20th year of cooperation with the U.S. Minerals Management Service in an effort to locate and document offshore sand occurrences. This was accomplished by conducting marine seismic surveys and collecting vibra-core samples from the sea bed at various locations along the New Jersey coast. For 2004, efforts included vibra-core sampling in the waters off Atlantic City.

Recent publications and maps concerning the geology of New Jersey are available on the Internet at URL http://www.njgeology.org/.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Lloyd Mullikin, Supervising Geologist, authored the text of the State mineral industry information provided by the New Jersey Geological Survey.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW JERSEY[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	W	W	W	W	W	122
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	16,000	96,300	18,200	105,000	20,100	120,000
Industrial	1,420	32,700	1,570	32,700	2,020	35,800
Stone, crushed	20,500	118,000 r	24,800	179,000	25,500	186,000
Combined values of greensand marl, peat, and values indicated by symbol W	XX	3,910	XX	4,190	XX	(3)
Total	XX	251,000 r	XX	321,000	XX	341,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
NEW JERSEY: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1	W	W	$7.28 r	1	W	W	$7.28	--	--	--	--
Granite	9 r	7,240 r	$45,600 r	6.30 r	9	10,100	$72,300	7.16	7	W	W	$7.15
Traprock	14 r	12,600 r	68,200 r	5.42 r	14	14,300	105,000	7.29	15	16,800	$124,000	7.37
Miscellaneous stone	(2)	W	W	3.58	(2)	W	W	3.58	(2)	W	W	3.58
Total or average	XX	20,500	118,000 r	5.78 r	XX	24,800	179,000	7.23	XX	25,500	186,000	7.28

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Sales/distribution yards.

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TABLE 3a

NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.61
Riprap and jetty stone	72	$981	13.63
Other coarse aggregate	595	4,420	7.43
Total or average	667	5,400	8.10
Coarse aggregate, graded:			
Concrete aggregate	2,560	19,900	7.77
Bituminous aggregate coarse	1,610	12,400	7.73
Railroad ballast	276	2,480	8.98
Other graded coarse aggregate	1,910	15,900	8.32
Total or average	6,360	50,700	7.98
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,180	6,820	5.77
Stone sand, bituminous mix or seal	(2)	(2)	7.31
Screening, undesignated	1,640	10,900	6.64
Other fine aggregate	417	3,510	8.42
Total or average	3,240	21,200	6.55
Coarse and fine aggregates:			
Graded road base or subbase	1,960	14,600	7.43
Crusher run (select material or fill)	(3)	(3)	7.31
Other coarse and fine aggregate	5,550	38,400	6.93
Total or average	7,510	53,000	7.06
Unspecified:[4]			
Reported	2,500	17,900	7.16
Estimated	4,500	31,000	6.86
Total or average	7,000	49,000	6.97
Grand total or average	24,800	179,000	7.23

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2] Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3] Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b

NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	72	$630	$8.75
Filter stone	W	W	7.28
Other coarse aggregates	126	1,070	8.49
Total or average	199	1,700	8.52
Coarse aggregate, graded:			
Concrete aggregate	1,880	15,200	8.11
Bituminous aggregate coarse	(2)	(2)	7.11
Railroad ballast	(2)	(2)	8.40
Other graded coarse aggregates	2,260	18,900	8.36
Total or average	4,130	34,100	8.25
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	7.28
Stone sand, bituminous mix or seal	(3)	(3)	7.39
Screening, undesignated	881	6,130	6.96
Other fine aggregates	229	1,680	7.35
Total or average	1,110	7,810	7.04
Coarse and fine aggregates:			
Graded road base or subbase	1,000	7,320	7.32
Terrazzo and exposed aggregate	(4)	(4)	16.86
Crusher run or fill or waste	55	388	7.05
Other coarse and fine aggregates	5,740	39,400	6.86
Total or average	6,800	47,100	6.93
Unspecified:[5]			
Reported	9,180	67,100	7.30
Estimated	4,100	28,000	6.84
Total or average	13,300	94,900	7.16
Grand total or average	25,500	186,000	7.28

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2, 3]

(Thousand metric tons and thousand dollars)

Use	District 1 and 3	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[4]	667	5,400
Coarse aggregate, graded[5]	6,360	50,700
Fine aggregate (-⅜ inch)[6]	3,240	21,200
Coarse and fine aggregate[7]	7,510	53,000
Unspecified:[8]		
Reported	2,500	17,900
Estimated	4,500	31,000
Total	24,800	179,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone produced for District 2.
[3]District 3 included in District 1 to avoid disclosing company proprietary data.
[4]Includes macadam, riprap and jetty stone, and other coarse aggregates.
[5]Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[6]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.
[7]Includes crusher run (select material or fill), graded road base or subbase, and other coarse and fine aggregates.
[8]Reported and estimated production without a breakdown by end use.

TABLE 4b

NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2, 3]

(Thousand metric tons and thousand dollars)

Use	District 1 and 3	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[4]	199	1,700
Coarse aggregate, graded[5]	4,130	34,100
Fine aggregate (-⅜ inch)[6]	1,110	7,810
Coarse and fine aggregate[7]	6,800	47,100
Unspecified:[8]		
Reported	9,180	67,100
Estimated	4,100	28,000
Total	25,500	186,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone produced for District 2.
[3]District 3 included in District 1 to avoid disclosing company proprietary data.
[4]Includes filter stone, riprap and jetty stone, and other coarse aggregates.
[5]Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[6]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.
[7]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.
[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,830	$14,100	$7.69
Plaster and gunite sands	32	350	10.94
Concrete products (blocks, bricks, pipe, decorative, etc.)	110	722	6.56
Asphaltic concrete aggregates and other bituminous mixtures	1,600	9,830	6.14
Road base and coverings	115	881	7.66
Fill	2,110	12,000	5.69
Snow and ice control	40	312	7.80
Other miscellaneous uses[2]	142	1,220	8.58
Unspecified:[3]			
Reported	5,420	27,200	5.02
Estimated	6,800	38,000	5.63
Total or average	18,200	105,000	5.77

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,880	$19,100	$6.63
Plaster and gunite sands	254	1,910	7.54
Concrete products (blocks, bricks, pipe, decorative, etc.)	152	2,110	13.90
Asphaltic concrete aggregates and other bituminous mixtures	4,730	27,600	5.83
Road base and coverings	278	1,750	6.28
Fill	1,340	4,650	3.48
Snow and ice control	30	193	6.42
Other miscellaneous uses[2]	374	4,100	10.97
Unspecified:[3]			
Reported	3,100	17,900	5.75
Estimated	7,000	40,000	5.80
Total or average	20,100	120,000	5.95

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a

NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	864	6,840	W	W
Asphaltic concrete aggregates and road base materials	W	W	1,060	7,110	W	W
Fill	54	326	1,540	9,640	511	2,020
Other miscellaneous uses[3]	895	7,880	38	417	1,010	5,130
Unspecified:[4]						
Reported	795	2,790	2,210	12,000	2,410	12,400
Estimated	1,400	9,700	2,600	13,600	2,800	15,000
Total	3,140	20,700	8,350	49,700	6,690	34,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

TABLE 6b

NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	824	8,710	859	5,110	1,610	9,330
Asphaltic concrete aggregates and road base materials	W	W	4,210	25,200	W	W
Fill	572	1,980	325	1,470	441	1,200
Other miscellaneous uses[3]	296	2,930	112	807	796	4,650
Unspecified:[4]						
Reported	--	--	2,240	12,500	867	5,360
Estimated	1,300	8,300	1,700	9,800	4,000	22,000
Total	2,970	21,900	9,400	54,900	7,740	42,800

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

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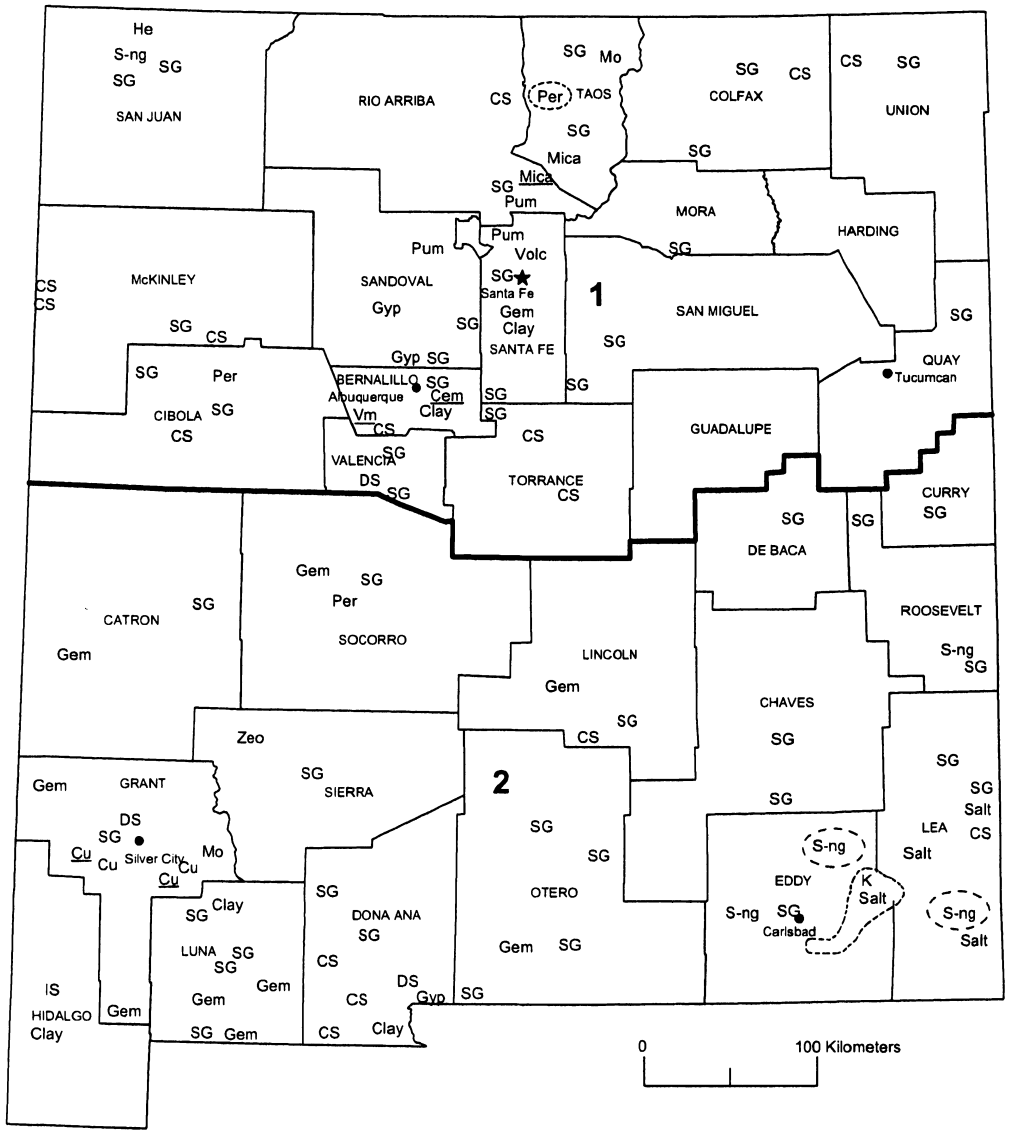
NEW MEXICO



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
DS	Dimension stone
Gem	Gemstones
Gyp	Gypsum
He	Helium
K	Potash
Mica	Mica
Mica	Mica plant
Mo	Molybdenum
Per	Perlite
Pum	Pumice
S-ng	Sulfur (natural gas)
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite plant
Volc	Volcanic cinder
Zeo	Zeolites
⬭	Concentration of mineral operations

Source: New Mexico Bureau of Geology and Mineral Resources/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Geology and Mineral Resources for collecting information on all nonfuel minerals.

In 2004, New Mexico's nonfuel raw mineral production was valued[1] at $866 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of more than 52% compared with 2003[2] and followed a 2.1% increase from 2002 to 2003. The State rose to 20th from 25th in rank among the 50 States in total nonfuel mineral production value and accounted for nearly 2% of the U.S. total.

The top nonfuel minerals in New Mexico in 2004 were, by value, copper and potash, followed by construction sand and gravel, molybdenum concentrates, and cement (portland and masonry). These five accounted for more than 91% of the State's total nonfuel raw mineral production value. After being second in value to potash in 2002 and 2003, copper again was the State's leading nonfuel mineral in 2004; copper has led for 34 of the past 37 years (from 1968 through 2004). Potash (reported as potassium salts prior to 1990) had been the State's leading nonfuel mineral in the early 1950s through 1967 and in 1982.

In 2004, the largest increases in value were those of copper and of molybdenum concentrates, values up nearly $200 million and $45 million, respectively, as a result of substantial production increases and significantly higher average copper prices and molybdenum concentrate prices. Potash and construction sand and gravel production and values also substantially increased in 2004, the value of potash being up by about $32 million and that of construction sand and gravel up by about $24 million. Smaller yet significant increases took place (in descending order of change) in the production and values of gold, perlite (up more than $1 million) and silver, as well as in the production of zeolites, up by more than 20%. With rising and overall higher average metal prices, byproduct gold and byproduct silver were produced from the processing of copper at Phelps Dodge operations in Grant County. The largest decreases in value for the year were those of cement, down somewhat more than $5 million and crushed stone, down $1.6 million (table 1).

Nearly all the State's molybdenum concentrate was mined and processed at Molycorp Inc.'s Questa Mine and mill in Taos County; the remainder was produced as byproduct from copper processing from Phelps Dodge Corp.'s Grant County copper operations. The trend toward the recent heights in molybdenum concentrate prices began in December 2002 and continued on throughout 2003 and 2004. For example, the average price of molybdic oxide rose from $8.27 per kilogram in 2002 to $11.75 per kilogram in 2003 to $36.73 per kilogram in 2004 and reached $68.86 in December 2004. Molybdenum concentrate prices remained high and continued to increase more gradually during the early months of 2005. (Prices were reported in Platts Metals Week in dollars per pound of contained molybdenum.)

In 2003, with a significant increase in production the largest increase in value took place in portland cement, up about $12 million. Other smaller yet significant increases in value took place (in descending order of change) in that of mica; in the values of potash and pumice and pumicite of about $4 million each; in molybdenum concentrates, construction sand and gravel, and crushed stone, up about $3 million each; in salt, up about $2 million; and in Grade-A helium and dimension stone, up more than $1 million each. These increases more than offset the only substantial decrease for the year, that of copper, down about $22 million (table 1). Copper production dropped off in 2003, in part as a residual effect of the 2001-02 scaling back of some operations and the closing of others owing to lower metal prices, but its value decreased at a lesser rate in 2003 because of rising and higher average copper prices.

In 2004, New Mexico continued to lead the Nation in the quantities of potash, perlite, and zeolites produced (descending order of value) and remained second in mica, and third in copper. The State increased to eighth from ninth in dimension stone; resumed the production of silver and gold, ranking eighth and ninth in each commodity, respectively; and decreased to fourth from third in pumice and pumicite and to sixth from fifth in molybdenum concentrates. Additionally, New Mexico was a significant producer of construction sand and gravel and gypsum.

The following narrative information was provided by the New Mexico Bureau of Geology and Mineral Resources[3] (BGMR). Production data in the text that follows are those reported by the BGMR and are based on the agency's own surveys and estimates. They may differ from some production figures published by the USGS.

Commodity Review

Industrial Minerals

Cement.—New Mexico produces seven different types of portland and masonary cement from the Tijeras cement plant operated by Grupos Cementos de Chihuahua (GCC) near Albuquerque. Overall estimated capacity of the plant was 600,000 metric tons per year (t/yr). Because of the nationwide

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Virginia T. McLemore, Senior Economic Geologist, authored the State mineral industry information provided by the New Mexico Bureau of Geology and Mineral Resources.

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cement shortage, the Tijeras cement plant implemented an allocation system to maintain a consistent flow of cement to the customer. The Tijeras cement plant was commissioned in 1959, and GCC took over operations in 1994. The main ingredient in cement is limestone mined at Tijearas with additional varying quantities of alumina, gypsum (locally obtained from throughout New Mexico), iron, and sandstone/shale.

Clays.—Two types of clay are mined in New Mexico—common and fire clay. Common clay was used for making bricks, roofing granules, and quarry tile. Commercial adobe yards mostly in northern New Mexico produced adobe bricks from local alluvial materials. Bricks were manufactured at the Kinney Brick mill in Albuquerque and Eagle plant in Dona Ana County.

Gemstones.—Gemstones produced in New Mexico include agate, azurite, fluorite, geodes, moonstone, onyx, peridot, smithsonite, and turquoise. Production statistics for 1998 to 2004 are withheld for gemstones in New Mexico; many noncommercial collectors do not report their income. Depletion of the known deposits and difficulty in and expense of adhering to Federal, State, and local environmental regulations have closed most of the commercial mines.

Gypsum.—Gypsum is used primarily in the manufacture of wallboard for homes, offices, and commercial buildings; other uses include the manufacture of portland and masonary cement, plaster of paris, and as a soil conditioner. Centex American Gypsum operated the White Mesa Mine near Cuba and two wallboard plants (Albuquerque and Bernalillo). Other smaller gypsum mines are operated in Sandoval and Dona Ana County.

Mica.—Mica is used as functional filler in building materials because of its unique physical characteristics, including color, durability, flexibility, thermal properties, and weight. It is used in the manufacture of numerous industrial and consumer products such as automotive sound deadening materials, coatings, joint compound, paints, thermoplastics, and many cosmetic products.

Only one mine produced mica in New Mexico in 2004, the U.S. Hill Mine (formerly MICA Mine) in Taos County, which has operated since 1960s. The mine closed in 2004. Oglebay-Norton Inc. acquired the mine in December 1999 from Franklin Industries. On September 22, 2003, Olgebay-Norton announced that the mica operation was for sale. Mica is produced from a muscovite quartz schist of Proterozoic age. Reserves are expected to last at least 49 years. The current mine covers approximately 6 hectares (ha).

Perlite.—Perlite is weathered (hydrated) natural glass that is formed by the rapid cooling of viscous, high-silica rhyolite lava. In New Mexico, perlite is found in high-silica rhyolite lava flows and lava domes that are typically 3.3 to 7.8 million years old. The distinguishing feature of perlite from other volcanic glasses is that when heated to more than 1,600° C, it expands or pops to 4 to 20 times its original volume to form lightweight glass foam. This expansion is because of the presence of 2% to 6% combined water in the mined perlite. This expansion also results in a white color. While the mined perlite may range from waxy to pearly or light gray to black or even brown, blue, or red, the color of expanded perlite ranges from snowy white to grayish white. Perlite is used in aggregate, building construction products, fillers, horticultural filter aids, and other uses. Perlite is produced from three mines in New Mexico: Socorro, El Grande, and No Agua.

Potash and Salt.—The Carlsbad potash district is the largest potash-producing area in the United States. Intrepid Mining LLC and Mosaic Co. operated mines in the district. Potash is used as fertilizer and as a chemical in specialty and industrial markets. Langbeinite ($K_2SO_4 \cdot 2MgSO_4$) and sylvite (KCl) are the primary potash minerals found in Permian evaporites of the Permian Basin in New Mexico. Mining is by underground methods. The estimated potash reserves in the district amount to more than 500 million metric tons (Mt). Sodium chloride salt also is produced locally as a byproduct. Salt is used in animal feed, oilfield drilling, and to deice roads.

When the combination of Cargill Crop Nutrition and IMC Global was completed on October 22, 2004, Mosaic Co. was born and is now the world's leading potash and phosphate producer. The capacity of the Mosaic potash mines was 450,000 metric tons (t) of red potash and 1.1 Mt of K-Mag (a naturally occurring mineral that consists of potassium, magnesium and sulfur). In 2004, Mosaic produced 3.2 Mt of ore containing 12.6% K_2O of red potash and 3.1 Mt of ore containing 7.4% K_2O of K-Mag. The total reserves at Mosaic included an estimated total of 137 Mt of potash ore in three mining beds at thickness ranging from 1.4 meters (m) to more than 3.4 m. These ore reserves were estimated to yield 8.1 Mt of sylvinite concentrate with an average grade of 60% K_2O and 27.6 Mt of langbeinite concentrate with an average grade of approximately 22% K_2O. These reserves are expected to last from 15 to 23 years.

Intrepid Mining NM LLC (owned by Intrepid Mining, LLC) announced on March 1, 2004, that it had completed the acquisition of all the assets of Mississippi Potash, Inc. and Eddy Potash, Inc., which includes four potash properties in Carlsbad, NM, for approximately $27.4 million and thereby became the leading potash producer in the United States. Intrepid employed approximately 650 people at 3 facilities in New Mexico. The West Facility, which consists of a potash mine and refinery, was originally built in 1929 by U.S. Potash and has a production capacity of approximately 488,000 t/yr of red potash. The East Facility, which has a production capacity of approximately 510,000 t/yr of white potash, comprises a potash mine, refinery, and compaction plant. The North Facility consists of a granular compaction plant and storage facilities. Two types of ore are processed; flotation is used to produce red potash, and hot leach crystallization is used to produce the higher purity white potash. Intrepid announced its intention to produce langbeinite by modifying the Carlsbad East potash plant to become the second langbeinite producer in the United States.

United Salt Corp. operated a solar evaporation salt plant near Carlsbad where salt is produced for animal feed.

Pumice.—The main use for pumice is as an aggregate in lightweight building blocks and assorted building products. Other major applications for pumice and pumicite included abrasive, absorbent, concrete aggregate and admixture, filter aid, horticultural (including landscaping), and the stonewashing of denim.

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Pumice is found in the Jemez Mountains and the Mogollon-Datil volcanic field; however, only seven operations are currently active in New Mexico. El Cajete pumice mine expansion in the Jemez Mountains (Copar Pumice Co.) was delayed for preparation of an environmental impact statement (draft released early 1997). The mine opened in 1997 and is expected to operate for 10 years. Reserves are estimated to be 90,000 t of pumice that will be used in making stonewashed jeans. Other pumice mines are active in the region.

Zeolites.—Zeolites are minerals found disseminated in altered volcanic ash, and clinoptilolite is the predominant mineral with unique physical, chemical, and cation-exchange properties for uses in agriculture, industrial, and environmental applications. Markets include animal feed supplements, cation-exchanged products, environmental products, filtration media, floor-drying agents, hygiene products (cat litter), industrial fillers and absorbents, mineral fillers, odor control and soil conditioners, and water and wastewater treatment.

St. Cloud Mining Co. (a subsidiary of Imagin Minerals, Inc.) operated the largest (in terms of production) zeolite mine in the United States at the Stone House Mine in Sierra County. Imagin Minerals, Inc. bought the St. Cloud Mining Company from The Goldfield Corporation in December 2002. St. Cloud Mining Co. has operated the open pit mine since 1993. The mining properties consisted of approximately 600 ha and contained 16.6 Mt of reserves with a capacity of 90,000 t/yr. Clinoptilolite is found in the altered Tertiary tuff of Little Mineral Creek. Clinoptilolite is mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. St. Cloud Mining Co. also has made several modifications to its zeolite operation, including the addition of cation-exchange capacity for added-value products and additional classification capabilities to expand markets for its products. The modern facility has the crushing and sizing capacity of 450 metric tons per day.

Other Industrial Minerals.—Helium is produced from the Shiprock and Ute Dome fields in the San Juan Basin. Helium is used in cryogenic applications, welding cover gas, pressurizing and purging, controlled atmospheres, leak detection, gas mixtures, and other uses.

Humates are weathered coal or highly organic mudstone that is found in the coal-bearing sequences. New Mexico has significant deposits of humates, predominantly in the Fruitland and Menefee formations in the eastern San Juan Basin. Humate is produced from five mines in New Mexico. The Horizon Ag Products Mine and mill are south of Cuba. Menefee Mining operated one pit and a mill near Cuba. The mining operations, processing site, and transportation facility of U-Mate International, Inc. is in the Gallup area. The Eagle Mesa Mine is near Cuba, and the Morningstar Mine is in San Juan County. Humate is used as a soil conditioner and as an additive to drilling muds. Approximately 11 billion metric tons of humate resources is within the San Juan Basin.

Small flagstone operations are throughout New Mexico producing sandstone, travertine, and other ornamental rock. The largest is the New Mexico Travertine plant near Belen.

Although garnet has not been produced in New Mexico from 1998 to 2004, at least one company was examining areas in the State for potential resources for uses as an abrasive. Garnet typically is found in skarn deposits in southern and central New Mexico, and in some areas, garnet is a major constituent of waste rock piles, remaining after recovery of metals. For example, approximately 135,000 t of material grading 20% to 36% garnet is estimated to occur in four tailings piles at Hanover. During 2004, domestic values for crude concentrates for different applications ranged from about $53 to $120 per metric ton, with an average for the year of $107 per metric ton (Olson, 2006§[4]). The domestic values for refined garnet for different applications sold during the year ranged from $61 to $298 per metric ton, with an average for the year of $255 per metric ton.

Metals

Copper.—The U.S. producer cathode price of copper averaged $1.34 per pound in 2004 (Edelstein, 2006, p. 2). In 2004, Phelps Dodge Corporation continued to leach copper at Santa Rita (Chino) and Tyrone Mines in New Mexico.

The Chino Mine at Santa Rita is the largest porphyry copper deposit in New Mexico. Copper sulfides are found in the upper fractured granodiorite and adjacent sedimentary rocks. Adjacent copper skarns are becoming increasingly more important economically. In January 2002, the Chino Mine and Hurley smelter were closed; the heap leach and solvent extraction-electrowinning process (SX-EW) plant remained in operation. In April 2003, mining for leach was resumed at Chino. In 2004, Chino produced 56,200 t of copper by SX-EW and 27,000 t of copper in concentrate (Phelps Dodge Corporation, 2005§). Estimated milling reserves at Chino in 2004 were 101 Mt of ore grading 0.71% copper and 0.02% molybdenum, and estimated leaching reserves were 256.4 Mt of ore grading 0.39% copper (Phelps Dodge Corporation, 2005§). In December 2003, Phelps Dodge Corporation acquired Heise's interest (33.3%) in Chino; Phelps Dodge Corporation now owns 100% of the reserves at Chino. As part of the purchase agreement, Heise paid approximately $64 million to a trust to fund its portion of closure, closeout, and reclamation costs. In February 2003, New Mexico Mining and Minerals Division issued Chino a closure permit with financial assurance established at approximately $191 million, and in December, the closure plan was approved.

The Tyrone porphyry copper deposit in the Burro Mountains occurs within a quartz monzonite laccolith and adjacent Proterozoic rocks. Several ore bodies, sometimes considered separate porphyry copper deposits, have been found. Though production of SX-EW copper continued from existing stockpiles, the mine was placed on care and maintenance in September 2003 and resumed open pit mining in 2004. In 2004, 39,100 t of copper was produced by SX-EW. In 2004, leaching reserves (recoverable copper) were estimated as 249.2 Mt of ore grading 0.31% copper (Phelps Dodge Corporation, 2005§). In addition, the Niagara deposit contained 450 Mt of mineralized material grading 0.29% copper as of December 2000. This mineralized material could be brought into production should market conditions warrant. In April 2004, New Mexico Mining

[4]References that include a section mark (§) are included in the Internet References Cited section.

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and Minerals Division approved Tyrone's closure plan with financial assurance established at approximately $271 million.

On February 3, 1998, Phelps Dodge Corporation acquired Cobre Mining Co., Inc. The acquisition included the open pit mine, two underground mines, two mills, and surrounding 4,500 ha of land. On October 21, 1998, Phelps Dodge Corporation suspended underground mining at Cobre because of low copper prices. On March 17, 1999, the remaining operations were suspended. The entire operation remains on care-and-maintenance status. Estimated milling reserves in 2004 are 52.2 Mt of 0.55% copper, and estimated leaching reserves are 70.6 Mt of 0.26% copper (Phelps Dodge Corporation, 2005§). Most of the copper reserves at the Cobre Mine are in the Syrena and upper part of the Lake Valley limestones north of the Barringer fault.

Molybdenum.—In New Mexico, molybdenum was produced from the Questa Mine in Taos County and as a byproduct of copper smelting in Grant County. Molybdenum is a refractory metallic element used principally as an alloying agent in steel, cast iron, and superalloys to enhance hardness, strength, toughness, and wear- and corrosion-resistance. Molybdenum also is used in fire retardants and in catalysts. The mineral molybdenite is used as a lubricant. On June 3, 2002, the New Mexico Mining and Minerals Division approved a closeout plan permit for Molycorp's molybdenum mine in Questa, New Mexico.

Molycorp Inc.'s (a subsidiary of Unocal) Questa molybdenum mining development and exploration operations continuously operated from 1923 through 1986 when soft market conditions caused the temporary shutdown of the mine until 1989. Mining operations again were placed on standby in 1992 and resumed in 1995. The price of molybdenum has increased during the last decade.

The company mined some 73 Mt of ore from its open pit at a grade of 0.191% molybdenum between 1965 and 1983. Underground block caving of ore commenced in 1983 and continues to this day. Current ore grade ranges between 0.3% and 0.5% molybdenum. Reserves and resources (as of November 1999) at Questa were as follows: proven reserves were 14.8 Mt of 0.343% MoS_2 at a cutoff grade 0.25% MoS_2; probable, 42.8 Mt of 0.315% MoS_2; possible, 2.9 Mt of 0.369% MoS_2.

When proven and probable reserves are considered, the mine life was 25 to 35 years, and when resources are included, the mine life was 50 to 80 years. Approximately 150 people worked at the mine in 2004. For comparison, Phelps Dodge Corporation reports molybdenum reserves at Climax to be 142 Mt of 0.19% molybdenum and at Henderson to be 150 Mt of 0.21% molybdenum in 2003 (Phelps Dodge Corporation, 2005§). Molycorp Inc. also continued with a reclamation and revegetation program to cover overburden rock piles at the inactive open pit site. In 2004, Molycorp continued remediation at the Goathill North rock pile to prevent continued downhill movement of the material.

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Phelps Dodge Corporation, 2005, Annual report, accessed on September 13, 2005, at URL http://library.corporate-ir.net/library/95/953/95336/items/112099/2004AR_3.pdf.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays, common		33	175	36	209	34	177
Copper[3]		112	187,000	88	165,000	122	362,000
Gemstones		NA	19	NA	20	NA	20
Sand and gravel, construction		12,800	62,600	13,300	65,300	13,600	89,500
Silver	kilograms	--	--	--	--	3,570	767
Stone:							
Crushed		3,680	23,300	3,730	26,000	3,430	24,400
Dimension		20	1,370	57	2,590	57	2,430
Combined values of cement, gold (2004), gypsum (crude), helium (Grade-A), iron ore [usable (2002)], lime, mica [crude (2003-04)], molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, zeolites (2004)		XX	282,000 r	XX	310,000	XX	387,000
Total		XX	557,000 r	XX	569,000	XX	866,000

rRevised. NA Not available. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

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TABLE 2
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	19	2,340	$10,500	$4.49	18	2,310	$12,400	$5.39	14	2,120	$11,500	$5.40
Granite	2	W	W	9.85	2	W	W	10.34	1	W	W	11.20
Volcanic cinder and scoria	7	W	W	11.00	5	W	W	7.98	5	W	W	7.74
Miscellaneous stone	9	202	1,340	6.63	4	223	1,510	6.77	4	226	1,520	6.71
Total or average	XX	3,680	23,300	6.35	XX	3,730	26,000	6.97	XX	3,430	24,400	7.11

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3a
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	$8.56
Coarse aggregate graded:			
Concrete aggregate, coarse	(2)	(2)	11.22
Bituminous aggregate, coarse	(2)	(2)	12.14
Bituminous surface-treatment aggregate	(2)	(2)	9.81
Railroad ballast	(2)	(2)	11.24
Other graded coarse aggregates	36	$217	6.03
Total or average	889	9,860	11.09
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	10.03
Stone sand, bituminous mix or seal	(2)	(2)	10.99
Screening, undesignated	(2)	(2)	7.60
Total or average	115	977	8.50
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	6.94
Unpaved road surfacing	(2)	(2)	9.37
Total or average	22	157	7.14
Agricultural:			
Poultry grit and mineral food	W	W	9.37
Other agricultural uses	W	W	9.37
Chemical and metallurgical, cement manufacture	W	W	6.94
Unspecified:[3]			
Reported	685	3,370	4.92
Estimated	1,300	6,700	5.12
Total or average	2,000	10,100	5.05
Grand total or average	3,730	26,000	6.97

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$5.97
Filter stone	W	W	3.86
Total or average	10	$54	5.40
Coarse aggregate graded:			
Concrete aggregate, coarse	147	1,490	10.10
Bituminous aggregate, coarse	W	W	11.81
Bituminous surface-treatment aggregate	W	W	9.75
Railroad ballast	W	W	11.56
Other graded coarse aggregates	498	1,590	3.20
Total or average	1,360	11,300	8.33
Fine aggregate (-⅜ inch):			
Stone sand, concrete	145	1,130	7.81
Stone sand, bituminous mix or seal	W	W	10.71
Screening, undesignated	W	W	7.51
Other fine aggregate	14	120	8.57
Total or average	307	2,630	8.56
Coarse and fine aggregates:			
Graded road base or subbase	112	606	5.41
Unpaved road surfacing	W	W	9.92
Crusher run or fill or waste	W	W	4.26
Other coarse and fine aggregates	4	34	8.50
Total or average	119	658	5.53
Other construction materials	21	140	6.67
Agricultural, other agricultural uses	(2)	(2)	10.00
Unspecified:[3]			
Reported	729	3,640	4.99
Estimated	880	5,900	6.73
Total or average	1,610	9,580	5.94
Grand total or average	3,430	24,400	7.11

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	--	--	--	--
Coarse aggregate, graded[3]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--	--	--
Coarse and fine aggregate[5]	W	W	W	W	--	--
Agricultural[6]	W	W	--	--	--	--
Chemical and metallurgical[7]	W	W	--	--	--	--
Unspecified[8]						
Reported	138	852	486	2,150	61	367
Estimated	650	3,200	660	3,500	--	--
Total	2,500	19,800	1,170	5,830	61	367

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes riprap and jetty stone.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[4]Includes screening (undesignated), stone sand bituminous mix or seal, and stone sand (concrete).
[5]Includes graded road base or subbase and unpaved road surfacing.
[6]Includes poultry grit and mineral food and other agricultural uses.
[7]Includes cement manufacture.
[8]Reported and estimated production without a breakdown by end use.

TABLE 4b
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	--	--	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W	--	--
Other construction materials	--	--	21	140	--	--
Agricultural[6]	(7)	(7)	--	--	--	--
Unspecified[8]						
Reported	175	1,060	485	2,150	69	420
Estimated	740	5,300	150	650	--	--
Total	2,420	18,500	931	5,410	69	420

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone and riprap and jetty stone.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregate.
[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.
[6]Includes other agricultural uses.
[7]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."
[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,500	$13,700	$5.50
Plaster and gunite sands	324	1,530	4.73
Concrete products (blocks, bricks, pipe, decorative, etc.)	98	1,170	11.91
Asphaltic concrete aggregates and other bituminous mixtures	1,210	9,400	7.77
Road base and coverings	1,990	11,500	5.76
Fill	836	3,370	4.03
Other miscellaneous uses[2]	92	396	4.30
Unspecified:[3]			
Reported	4,260	12,400	2.91
Estimated	2,000	12,000	5.90
Total or average	13,300	65,300	4.89

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast and snow and ice control.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,340	$17,700	$7.59
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	327	2,810	8.57
Asphaltic concrete aggregates and other bituminous mixtures	2,410	21,400	8.88
Road base and coverings	2,240	14,100	6.28
Fill	829	3,000	3.62
Other miscellaneous uses[3]	665	9,660	14.54
Unspecified:[4]			
Reported	2,920	10,900	3.74
Estimated	2,000	9,900	5.17
Total or average	13,600	89,500	6.56

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6a
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,850	10,300	638	3,400	5	83
Concrete products (blocks, bricks, pipe, decorative, etc.)	311	2,210	111	492	--	--
Asphaltic concrete aggregates and other bituminous mixtures	832	7,120	378	2,270	--	--
Road base and coverings	989	5,590	924	4,590	74	1,270
Fill	624	2,510	194	558	18	297
Other miscellaneous uses[2]	77	313	15	84	--	--
Unspecified:[3]						
Reported	2,070	8,270	444	1,200	1,750	2,940
Estimated	1,200	7,500	870	4,300	--	--
Total	7,930	43,800	3,570	16,900	1,850	4,590

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast and snow and ice control.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6b

NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,670	13,100	644	4,420	24	196
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	294	2,480	34	327	--	--
Asphaltic concrete aggregates and other bituminous mixtures	2,040	17,600	373	3,740	(3)	2
Road base and coverings	1,290	7,900	795	4,430	149	1,720
Fill	561	2,260	257	606	11	130
Other miscellaneous uses[4]	582	9,190	78	420	5	54
Unspecified:[5]						
Reported	1,640	7,480	557	2,260	721	1,190
Estimated	950	5,700	970	4,200	--	--
Total	9,030	65,800	3,710	20,400	910	3,300

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Less than ½ unit.

[4]Includes railroad ballast and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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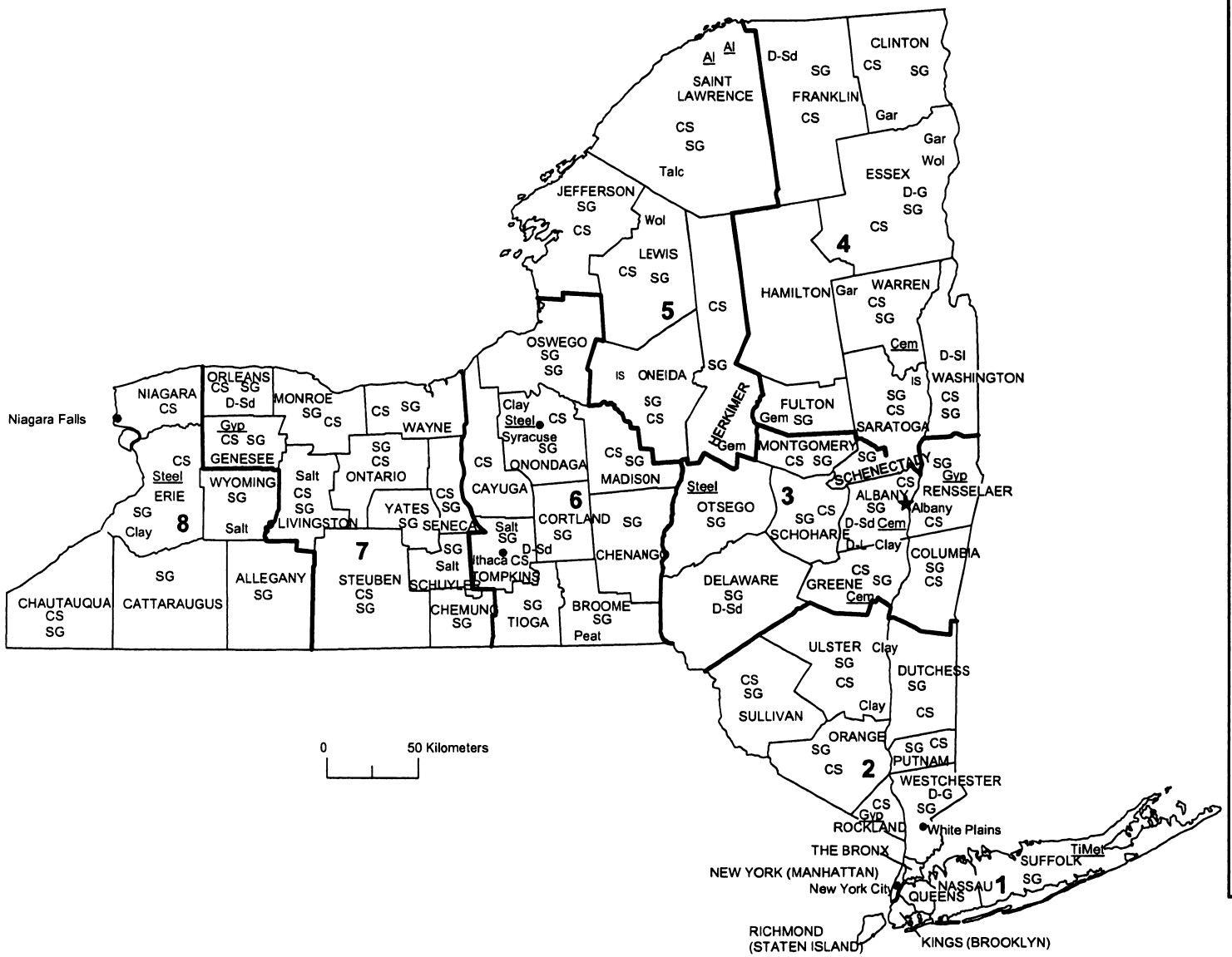
NEW YORK



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
D-Sl	Dimension slate
Gar	Garnet
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Peat	Peat
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
Talc	Talc
TiMet	Titanium metal plant
Wol	Wollastonite

Source: New York State Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NEW YORK

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New York State Geological Survey for collecting information on all nonfuel minerals.

In 2004, New York's nonfuel raw mineral production was valued[1] at $1.11 billion, based upon annual U.S. Geological Survey (USGS) data. This was an 11.2% increase from the $998 million total value for 2003,[2] which was marginally up from 2002. The State, for the third consecutive year, was 14th in rank among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 2.5% of the U.S. total value.

In 2004, crushed stone, by value, remained New York's leading nonfuel mineral, followed by salt, cement (portland and masonry), construction sand and gravel, and wollastonite. These five mineral commodities accounted for about 98% of the State's total nonfuel mineral production value. Salt led New York's increase in value; a 23% increase in production generated a 34%, or $76 million increase in the commodity's value. The values of construction sand and gravel and cement were up about $17 million each, followed by increases in wollastonite and common clays, up nearly $5 million and nearly $3 million, respectively. The largest decrease in value was that of crushed stone, down about $3 million (table 1).

In 2003, increases in the production of salt and construction sand and gravel, up $40 million and $14 million, respectively, led to the State's increase in value (table 1). An increase in the production of talc resulted in a rise in value of nearly $2 million. These increases were offset to a significant degree by a $39 million drop in crushed stone and a significant decrease in portland cement. Although relatively small in comparison, the value of wollastonite showed a decrease.

In 2004, New York continued to be the only State to produce wollastonite, as well as first in the quantity of industrial garnet produced of two producing States, third in the production of salt, and fourth in talc. Additionally, New York mining and mineral processing operations produced significant quantities of, in descending order of value, crushed stone (14th in rank), portland cement (11th), construction sand and gravel (12th), masonry cement (11th), and common clays (14th). The State was ninth (eighth in 2003) in the production of dimension stone. Primary aluminum and raw steel were produced from materials obtained from other domestic and foreign sources. New York, with a decrease in primary aluminum production, was seventh in rank (sixth in 2003) among 12 producing States.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The following narrative information was provided by the New York State Geological Survey[3] (NYSGS) and the Division of Mineral Resources (DMR) of the New York State Department of Environmental Conservation (DEC).

Commodity Review

Industrial Minerals

Crushed Stone.—Record values for bluestone has spurred new activity in 2004. An operator in Delaware County installed a new computer-operated 10-foot-diameter stone saw and associated equipment costing roughly $175,000. The new facility includes a totally enclosed building with a closed loop system to collect process water. By New York bluestone industry standards, the new saw is a very significant investment and a good sign of industry health. In addition to the higher prices, the bluestone industry has also benefited from the new Exploration Authorization process which the DEC helped tailor to the industries needs and potential environmental impacts. This has allowed more rapid exploration and enhanced environmental compliance. The current record high value of bluestone prompted mine operators to restart activity at old, previously inactive unpermitted mines where neighboring new property owners are no longer accustomed to the activity. As a result, mining complaints were significantly higher in 2004.

Metals

Zinc.—The zinc mine in St. Lawrence County remained closed under the ownership of St. Lawrence Zinc Co. In 2004, the company became a subsidiary of Hudson Bay Mining and Smelting Co., a vertically integrated Canadian mining company and producer of copper, zinc, and precious metals from its mines and plants in Manitoba and Saskatchewan. Announced plans for the mine include more exploratory drilling and reopening of the mine when economic conditions permit.

Environmental Issues and Mine Reclamation

Demand for minerals in New York continued to increase; however, the siting of new mines across the State remained highly controversial. Consolidation of operations and absorption of family-owned mines by large multinational companies has become the norm in the State. The main industry trend is for existing sand and gravel and hard rock quarries to expand operations. Several proposals have generated controversy based upon an expansion (often doubling) of the footprint of the mine or a change from sand and gravel

[3]William Kelly, State Geologist of the New York State Geological Survey (a bureau of the New York State Museum in the State Education Department), Division of Research and Collections authored the text of the State mineral industry information provided by those State agencies.

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extraction to mining the underlying bedrock. The majority of these operations are proposing to mine deeper within previously approved limits. The main issues associated with these operations are assessing the impacts from mining into the water table. Other issues of concern to the public continue to include noise, blasting, traffic, visual impacts, and extended life-of-mine terms. Applications for new mines in the Hudson River corridor have received much public opposition.

The number of permitted nonfuel mineral mining operations was lower in 2004 than that of 2003. Public opposition to new mining operations and the time and financial requirements of the regulatory process are the main reasons for the decline. This continues the trend of the past several years, especially in the lower Hudson Valley region and Long Island. During 2004, the DEC issued 461 mined land reclamation permits; of those issued, however, only 54 permits were for new operations. The new permits and their associated commodities were: sand and gravel (38), bluestone (5), clay (4), topsoil (3), and dolostone, limestone, peat, shale (1 each). The remaining 407 permits were either renewals or modifications.

A total of nearly 23,100 hectares (ha) of land was affected by mining at the end of 2004 out of a total life-of-mine approved area of 44,152 ha. A total of 647 ha was reclaimed in 2004, 354 of these were concurrent with mining, while 293 ha constituted final reclamation. The breakdown of mines that received final reclamation and their commodities were: sand and gravel (83), shale (2), and bluestone, clay, emery, peat (1 each). Since the Mined Land Reclamation program's inception in 1975, approximately 9,700 acres of land affected by mining have been reclaimed.

The Mined Land Reclamation Program holds roughly $90 million in financial security to guarantee mine reclamation. However, recent experience with reclamation work contracted by DEC demonstrated that individual mine financial security amounts are too low. Based on current prices, approximately two-thirds of existing mined land reclamation permits have bonds that will not cover reclamation costs if the site is abandoned. The Mined Land Reclamation Law gives the Department the authority to set bonds at the level necessary to adequately reclaim a mine. Therefore, the Mined Land Reclamation program has started a comprehensive review of its current financial security requirements as a first step toward increasing the bonding amounts.

Mines on lands associated with the Indian Nations continued to present challenges to the Mined Land Reclamation program. In Madison County, DEC continued attempts to force reclamation of a mine site that is now owned by the Oneida Nation as part of a larger purchase of surrounding land. In Cayuga County, where an 80-acre mine site operated for many years without a permit, the consent order and reclamation settling these violations may be derailed. The Cayuga-Seneca Nation of Oklahoma has allegedly made a purchase offer for the mine site and surrounding property threatening the Department's legal jurisdiction.

In Suffolk County on Long Island, a legal challenge has arisen related to DEC's actions and discretion involved with mined land reclamation permits for mines located in the Core Preservation Area of the Central Pine Barrens, which comprises more than 900 square miles of terrestrial and marine environments. This region contains the largest remnant of a forest thought to have once encompassed more than 100,000 ha on Long Island. The Central Pine Barrens overlies one portion of Long Island's federally designated sole source aquifer for drinking water. Litigants claim that the Environmental Conservation Law provides that State approved mining permits must conform to the provisions of a land-use plan. Approximately 15 mining operations are located in the Central Pine Barrens. A review of DEC authority is underway.

Legislation and Government Programs

The DEC Divisions of Mineral Resources and Public Affairs worked together to create a Flash presentation on the Mined Land Reclamation program for the DEC's Web site at URL http://www.dec.state.ny.us/website/dmn/recflash/index.html. The Division's new presentation gives an overview of basic mine reclamation requirements, the Department's use of financial security to ensure reclamation, and the steps involved in reclaiming a mine. Visitors learn how the Department protects the environment through its permitting program and shown examples of successful mine reclamation.

The New York State Annual Mined Land Reclamation Award for 2004 was presented to the Dutchess Quarry and Supply Company for its voluntary reclamation of an abandoned sand and gravel mine in Dutchess County. The operator acquired the site and contour graded the affected land to blend in with the surrounding landscape. The site was seeded with a cool season grass/legume seed mixture for stabilization.

New York Governor Pataki participated in the July 4th dedication ceremony for the cornerstone of the new Freedom Tower that is to be erected on the former site of the World Trade Center in New York, NY. A 10 by 5 by 4 foot block of dressed stone weighing more than 18 metric tons was chosen for this memorial. The cornerstone is the ore from a garnet producer in Warren County. The company has been mining garnet in the Adirondack Mountains since the late 1800s. Garnet is the official New York State gemstone.

The NYSGS continued bedrock and surficial geologic mapping projects in several regions of the State. Mapping priority was given to areas in which expanding development of surrounding urban areas and along transportation corridors drove a need for, and understanding of, mineral resources, among other topics. The NYSGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: FEDMAP, which funds Federal geologic mapping projects, STATEMAP, which is a matching-funds grant program with State geological surveys, and EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. Maps are produced at a scale of 1:24,000. In 2004, digital maps were produced of five and a half 7 ½ minute quadrangles in New York.

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Mined-out cavities are a statewide problem when homes, industries, communication, and transportation systems expand into sparsely developed areas with little or no surface indication of the presence of an abandoned mine. This issue needs to be addressed before new construction can commence as collapses have occurred under structures built over mined-out areas. Mining companies were not required to provide mine maps to any governmental agency when mines were closed. The NYSGS, in cooperation with the DEC, and funded by a grant from the Mine Safety and Health Administration, located 255 abandoned underground mines and more than 1,300 related maps for properties that were excavated for commodities ranging from arsenic to zinc within the State of New York. The majority of these are iron mines that are most prolific in the Adirondack Mountains and Hudson Highlands regions. These metal mines can extend more than 2,000 feet underground. The mines with the largest aerial extent are in central and western New York where gypsum and salt mines stretch literally for miles.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW YORK[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	641	7,990	644	8,050	756	10,900
Gemstones	NA	65	NA	65	NA	74
Salt	4,610	185,000	5,230	225,000	6,430	301,000
Sand and gravel, construction	29,800	158,000	30,200	172,000	33,100	189,000
Stone:						
Crushed	56,500	391,000	53,700	352,000	52,700	349,000
Dimension	46	5,990	65	6,110	44	4,560
Combined values of cement, garnet (industrial), peat, sand and gravel (industrial), talc (crude), wollastonite	XX	243,000	XX	235,000	XX	256,000
Total	XX	991,000	XX	998,000	XX	1,110,000

NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
NEW YORK: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	56	29,100	$174,000	$5.99	54	30,100	$191,000	$6.35	58	30,500	$194,000	$6.38
Dolomite	13	13,600	101,000	7.43	13	11,300	78,900	6.98	13	10,700	77,100	7.23
Marble	1	W	W	4.13	1	W	W	6.30	1	W	W	5.87
Granite	8	3,630	19,600	5.39	7	3,760	20,300	5.41	7	3,870	20,800	5.37
Traprock	3	W	W	9.81	2	W	W	6.94	2	W	W	6.94
Sandstone	10	1,670	14,400	8.62	7	2,070	17,000	8.19	9	2,070	17,700	8.53
Slate	1	W	W	5.73	1	W	W	5.73	1	W	W	5.73
Miscellaneous stone	2	284	1,680	5.92	2	295	2,090	7.11	3	284	2,000	7.05
Total or average	XX	56,500	391,000	6.92	XX	53,700	352,000	6.56	XX	52,700	349,000	6.62

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$7.99
Riprap and jetty stone	140	$1,270	9.05
Filter stone	140	1,110	7.93
Other coarse aggregates	1,720	15,100	8.80
Total or average	2,000	17,500	8.76
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,160	9,210	7.91
Bituminous aggregate, coarse	912	6,410	7.03
Bituminous surface-treatment aggregate	957	6,980	7.29
Railroad ballast	31	240	7.74
Other graded coarse aggregates	2,410	20,400	8.47
Total or average	5,470	43,200	7.90
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	7.06
Stone sand, bituminous mix or seal	757	5,630	7.43
Screening, undesignated	286	2,060	7.19
Other fine aggregates	1,700	15,000	8.81
Total or average	2,740	22,700	8.26
Coarse and fine aggregates:			
Graded road base or subbase	2,510	17,600	7.02
Terrazzo and exposed aggregate	(3)	(3)	6.51
Crusher run or fill or waste	1,640	8,690	5.28
Other coarse and fine aggregate	3,220	19,700	6.11
Total or average	7,370	46,000	6.24
Other construction materials[4]	292	2,550	8.73
Agricultural:			
Agricultural limestone	934	8,240	8.82
Other agricultural uses	5	46	9.20
Total or average	939	8,290	8.83
Chemical and metallurgical, cement manufacture	(5)	(5)	3.31
Special, asphalt fillers or extenders	(5)	(5)	6.55
Unspecified:[6]			
Reported	20,900	138,000	6.62
Estimated	12,000	66,000	5.66
Total or average	32,600	204,000	6.27
Grand total or average	53,700	352,000	6.56

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data, included with "Other coarse and fine aggregates."

[4]Includes drain fields.

[5]Withheld to avoid disclosing company proprietary data, included in "Grand total."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	146	$1,740	$11.92
Riprap and jetty stone	170	1,420	8.37
Filter stone	153	1,340	8.76
Other coarse aggregates	454	3,400	7.49
Total or average	923	7,900	8.56
Coarse aggregate, graded:			
Concrete aggregate, coarse	873	7,650	8.76
Bituminous aggregate, coarse	1,690	14,000	8.30
Bituminous surface-treatment aggregate	276	2,380	8.62
Railroad ballast	W	W	7.70
Other graded coarse aggregates	1,780	17,100	9.63
Total or average	4,620	41,200	8.92
Fine aggregate (-¾ inch):			
Stone sand, concrete	(2)	(2)	5.68
Stone sand, bituminous mix or seal	617	4,220	6.84
Screening, undesignated	507	3,980	7.85
Other fine aggregates	2,230	20,200	9.03
Total or average	3,360	28,400	8.45
Coarse and fine aggregates:			
Graded road base or subbase	2,370	16,900	7.15
Unpaved road surfacing	61	463	7.59
Crusher run or fill or waste	2,010	10,900	5.42
Roofing granules	(3)	(3)	5.30
Other coarse and fine aggregates	5,760	38,200	6.62
Total or average	10,200	66,500	6.51
Other construction materials	42	375	8.93
Agricultural:			
Agricultural limestone	90	673	7.48
Other agricultural uses	5	46	9.20
Total or average	95	719	7.57
Chemical and metallurgical, cement manufacture	(4)	(4)	5.21
Special, other fillers or extenders	(4)	(4)	4.00
Other miscellaneous uses and specified uses not listed	39	213	5.46
Unspecified:[5]			
Reported	20,700	136,000	6.54
Estimated	8,400	46,000	5.44
Total or average	29,100	181,000	6.22
Grand total or average	52,700	349,000	6.62

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data, included in "Grand total or average."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	--	--
Coarse aggregate, graded[4]	W	W	1,830	13,700	--	--
Fine aggregate (-⅜ inch)[5]	W	W	1,060	8,660	--	--
Coarse and fine aggregate[6]	W	W	1,310	8,240	--	--
Other construction materials[7]	--	--	29	320	--	--
Agricultural[8]	W	W	W	W	--	--
Chemical and metallurgical[9]	--	--	W	W	--	--
Special[10]	--	--	--	--	--	--
Unspecified:[11]						
Reported	12,200	84,700	1,460	10,500	--	--
Estimated	2,900	20,000	1,500	8,200	3,800	19,000
Total	17,200	126,000	11,200	71,500	3,800	19,000

	District 5		District 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	192	1,590
Coarse aggregate, graded[4]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W	W	W
Coarse and fine aggregate[6]	W	W	W	W	W	W
Other construction materials[7]	--	--	--	--	69	356
Agricultural[8]	W	W	--	--	W	W
Chemical and metallurgical[9]	--	--	--	--	--	--
Special[10]	W	W	--	--	--	--
Unspecified:[11]						
Reported	2,660	15,800	2,270	13,500	2,280	13,600
Estimated	850	4,200	1,500	8,800	820	4,800
Total	5,230	29,400	4,400	27,100	8,070	50,900

	District 8	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregate[6]	W	W
Other construction materials[7]	194	1,870
Agricultural[8]	W	W
Chemical and metallurgical[9]	--	--
Special[10]	--	--
Unspecified:[11]		
Reported	53	348
Estimated	130	740
Total	3,800	28,100

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced in District 1.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.

[6]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[7]Includes drain fields.

[8]Includes agricultural limestone and other agricultural uses.

[9]Includes cement manufacture.

[10]Includes asphalt fillers or extenders.

[11]Reported and estimated production without a breakdown by end use.

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TABLE 4b

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	222	2,640	383	2,690	W	W
Coarse aggregate, graded[4]	1,320	15,400	1,070	8,920	W	W
Fine aggregate (-⅜ inch)[5]	451	5,400	1,050	8,410	W	W
Coarse and fine aggregate[6]	677	6,880	3,020	20,200	W	W
Other construction materials	--	--	34	314	--	--
Agricultural[7]	--	--	W	W	W	W
Chemical and metallurgical[8]	--	--	W	W	W	W
Special[9]	--	--	--	--	--	--
Other miscellaneous uses and specified uses not listed	--	--	--	--	--	--
Unspecified:[10]						
Reported	10,500	73,100	825	4,720	--	--
Estimated	2,600	15,000	1,100	6,300	2,400	12,000
Total	15,800	118,000	11,000	71,000	4,080	22,600

	District 5		District 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	201	1,650
Coarse aggregate, graded[4]	W	W	W	W	464	3,060
Fine aggregate (-⅜ inch)[5]	W	W	W	W	613	4,410
Coarse and fine aggregate[6]	W	W	W	W	3,480	20,500
Other construction materials	--	--	8	61	--	--
Agricultural[7]	W	W	--	--	41	399
Chemical and metallurgical[8]	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--
Other miscellaneous uses and specified uses not listed	39	213	--	--	--	--
Unspecified:[10]						
Reported	2,700	16,000	2,310	13,700	2,930	17,100
Estimated	680	3,100	1,300	7,500	180	850
Total	5,600	30,700	4,200	25,900	7,920	48,000

	District 8	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	--	--
Coarse aggregate, graded[4]	W	W
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregate[6]	W	W
Other construction materials	--	--
Agricultural[7]	--	--
Chemical and metallurgical[8]	--	--
Special[9]	--	--
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[10]		
Reported	1,450	10,900
Estimated	120	710
Total	4,150	32,400

See footnotes at end of table.

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TABLE 4b--Continued
NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1,2]

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone produced in District 1.
[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.
[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[5]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.
[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.
[7]Includes agricultural limestone and other agricultural uses.
[8]Includes cement manufacture.
[9]Includes asphalt fillers or extenders.
[10]Reported and estimated production without a breakdown by end use.

TABLE 5a
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,110	$48,300	$7.91
Plaster and gunite sands	188	1,130	5.99
Concrete products (blocks, bricks, pipe, decorative, etc.)	181	1,610	8.87
Asphaltic concrete aggregates and other bituminous mixtures	2,240	12,000	5.34
Road base and coverings	3,290	15,200	4.62
Road stabilization (cement)	55	287	5.22
Road stabilization (lime)	17	58	3.41
Fill	2,280	6,830	2.99
Snow and ice control	1,010	4,930	4.87
Other miscellaneous uses[2]	368	2,160	5.38
Unspecified:[3]			
Reported	5,770	35,900	6.21
Estimated	8,700	44,000	5.03
Total or average	30,200	172,000	5.71

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filtration and railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,100	$35,000	$6.87
Plaster and gunite sands	250	1,580	6.31
Concrete products (blocks, bricks, pipe, decorative, etc.)	330	2,910	8.82
Asphaltic concrete aggregates and other bituminous mixtures	1,470	8,610	5.84
Road base and coverings	3,460	16,100	4.64
Road stabilization (cement and lime)	91	390	4.28
Fill	1,840	6,560	3.57
Snow and ice control	1,170	5,910	5.07
Railroad ballast	39	306	7.84
Filtration	20	141	7.20
Other miscellaneous uses	127	866	6.83
Unspecified:[2]			
Reported	8,610	55,300	6.42
Estimated	11,000	56,000	5.25
Total or average	33,100	189,000	5.72

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 6a
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,680	20,200	680	6,590	937	5,730
Asphaltic concrete aggregates and other bituminous mixtures[3]	--	--	W	W	276	1,300
Road base and coverings	W	W	118	1,020	769	3,360
Fill	155	751	87	649	1,030	2,310
Snow and ice control	W	W	W	W	288	1,470
Other miscellaneous uses[4]	89	985	137	1,360	105	693
Unspecified:[5]						
Reported	1,220	10,900	617	4,340	35	210
Estimated	500	3,100	1,900	9,800	600	2,600
Total	3,690	36,000	3,520	23,700	4,040	17,700

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,280	5,430	186	1,280	877	6,310
Asphaltic concrete aggregates and other bituminous mixtures[3]	215	996	--	--	1,250	7,060
Road base and coverings	267	1,090	212	761	836	3,770
Fill	403	921	57	134	289	1,070
Snow and ice control	108	378	62	189	248	969
Other miscellaneous uses[4]	7	63	--	--	199	747
Unspecified:[5]						
Reported	15	84	192	1,150	331	1,240
Estimated	1,100	5,500	300	1,700	1,600	8,000
Total	3,410	14,400	1,050	5,200	5,610	29,200

	District 7		District 8	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	501	3,110	339	2,380
Asphaltic concrete aggregates and other bituminous mixtures[3]	242	1,360	W	W
Road base and coverings	723	2,900	W	W
Fill	199	713	62	284
Snow and ice control	109	454	63	249
Other miscellaneous uses[4]	34	199	627	3,250
Unspecified:[5]				
Reported	828	4,880	2,530	13,000
Estimated	2,100	10,000	500	2,800
Total	4,700	23,900	4,150	22,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes filtration and railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	1,040	7,800	771	6,180	872	6,180
Asphaltic concrete aggregates and other bituminous mixtures	--	--	W	W	329	2,690
Road base and coverings[3]	W	W	W	W	864	4,800
Fill	141	782	62	252	577	1,540
Snow and ice control	W	W	W	W	298	1,600
Other miscellaneous uses[4]	39	631	135	1,220	47	344
Unspecified:[5]						
Reported	1,360	11,500	1,180	9,170	547	3,130
Estimated	830	4,700	2,100	11,000	870	3,800
Total	3,410	25,500	4,200	28,200	4,400	24,100

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	541	2,140	169	1,130	1,080	7,890
Asphaltic concrete aggregates and other bituminous mixtures	150	572	--	--	316	2,080
Road base and coverings[3]	289	994	245	1,060	913	4,120
Fill	263	485	132	457	296	1,100
Snow and ice control	100	384	150	372	262	1,090
Other miscellaneous uses[4]	2	10	2	87	23	143
Unspecified:[5]						
Reported	14	76	212	1,230	538	3,570
Estimated	1,500	7,900	470	2,500	1,800	9,300
Total	2,840	12,600	1,380	6,880	5,270	29,200

	District 7		District 8	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	334	2,310	873	5,890
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W
Road base and coverings[3]	853	3,630	309	1,150
Fill	153	625	212	1,320
Snow and ice control	96	368	197	1,190
Other miscellaneous uses[4]	225	1,240	532	2,530
Unspecified:[5]				
Reported	3,050	18,400	1,730	8,180
Estimated	2,200	11,000	920	5,000
Total	6,870	37,700	4,770	25,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes filtration and railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

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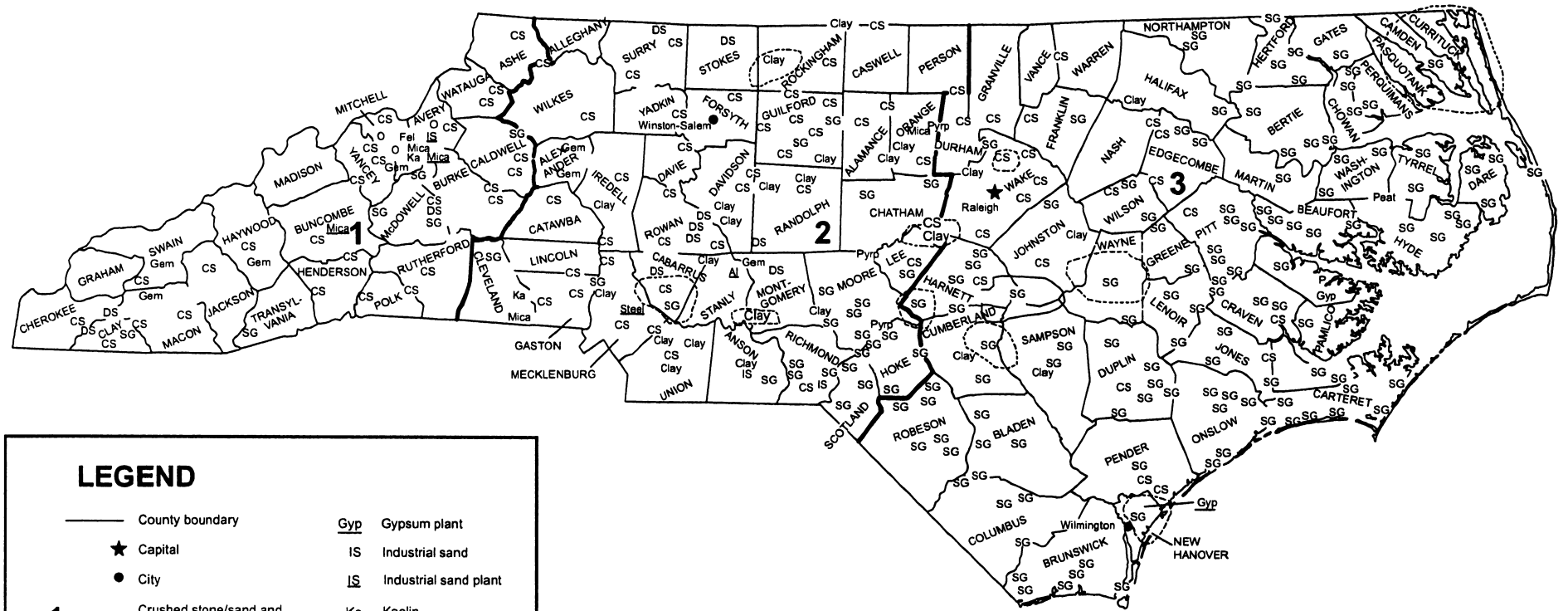
NORTH CAROLINA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Clay	Common clay
CS	Crushed stone
DS	Dimension stone
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
IS	Industrial sand plant
Ka	Kaolin
Mica	Mica
Mica	Mica plant
O	Olivine
P	Phosphate rock
Peat	Peat
Pyrp	Pyrophyllite
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

Source: North Carolina Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2004, North Carolina's nonfuel raw mineral production was valued[1] at $805 million, based upon annual U.S. Geological Survey (USGS) data. This was about a 9.7% increase from that of 2003[2] and followed a 6.5% increase from 2002 to 2003. The State was 21st in rank (19th in 2003) among the 50 States in total nonfuel mineral production value, of which North Carolina accounted for about 2% of the U.S. total.

Crushed stone remained North Carolina's leading nonfuel raw mineral in 2004, accounting for more than 68% of the State's total value of nonfuel raw mineral production. It was followed by phosphate rock, construction sand and gravel, industrial sand and gravel, feldspar, dimension stone, common clays, and mica. The largest increases in value for the year were in crushed stone and phosphate rock, up $43 million and $21 million, respectively. Smaller yet significant increases in value also took place in construction sand and gravel, industrial sand and gravel, common clays, and feldspar. The most significant decrease was that of a $3.7 million drop in the value of kaolin (table 1).

In 2003, crushed stone with a nearly 7% increase in production from 2002 led the way with a $54 million increase in value (an increase of 12% from 2002). Smaller yet significant increases took place, in descending order of change, in the values of mica, up $6.5 million and construction sand and gravel, up nearly $5 million. The most significant decrease in value was about $20 million in phosphate rock (table 1).

In 2004, North Carolina continued to lead the Nation in the quantities of feldspar, common clays, mica, olivine, and pyrophyllite produced; the latter two were produced in only one other State and North Carolina alone, respectively. North Carolina continued to be 3d in the production of phosphate rock, 7th in industrial sand and gravel, and 8th in crushed stone. The State decreased to 11th from 10th in gemstones (based upon value). Additionally, significant quantities of construction sand and gravel and dimension stone were produced in the State. Metal production in the State, especially that of primary aluminum and raw steel, resulted from the processing of recycled materials or raw materials received from other domestic and foreign sources.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The following narrative information was provided by the North Carolina Geological Survey[3] (NCGS).

Commodity Review

Industrial Minerals

Clays.—Increasing construction in the central Piedmont of North Carolina, known as the Triangle, and across the region has prompted General Shale Brick to expand production capacity at its Moncure plant. The Johnson City, Tennessee-based company is adding a third kiln, which will boost production capacity to 270 million bricks each year, up 50% from current annual capacity of 180 million bricks. The company is not saying how much the new fully automated kiln will cost, but 25 workers will be added when it begins firing brick in late 2005. General Shale currently has about 100 workers at the Moncure plant.

This is the second expansion at the site since General Shale Brick bought the State's largest brickmaker, Cherokee Sanford Brick, for $81 million in 2000. General Shale Brick is the Nation's second leading brickmaker, and the Moncure plant is its leading producer. General Shale's parent company (Weinerberger of Vienna) Austria, is the world's leading brickmaker in terms of sales (News and Observer, 2005a).

Gypsum.—The Clean Air Act of 2002 required utility companies burning high-sulfur coal and releasing sulfur dioxide into the atmosphere to reduce their sulfur dioxide emissions. As a result, utility companies have formed partnerships with wallboard companies to convert the sulfur dioxide emissions into synthetic gypsum (calcium sulfate), which can be used in the manufacture of wallboard. In the past, synthetic gypsum would have been sent to landfills as a combustion byproduct from the burning of coal. North Carolina's two major electric utilities, Progress Energy, Inc. and Duke Energy Corp., have announced plans to sell byproduct gypsum rather than send it to a landfill.

BPB plc, a manufacturer and marketer of wall and ceiling products throughout North America, announced on February 13, 2004, that it had completed a long-term agreement with Progress Energy to supply synthetic gypsum to a new gypsum wallboard plant in Roxboro, NC. The plant will generate more than 200 new jobs in the Roxboro area. Under the agreement, BPB will commission in 2007 a $100 million gypsum wallboard plant in Person County, NC, adjacent to Progress Energy's coal-fired power generator. The new facility will operate at world-class manufacturing standards and will produce 65 million square

[3]Jeffrey C. Reid, Senior Geologist for the Minerals and Geographic Information Systems, authored the text for the State mineral industry information provided by the North Carolina Geological Survey.

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meters per year of gypsum wallboard to meet expected sales volume growth. The agreement will provide BPB's new facility with a secure source of high-quality synthetic gypsum. The Person County Commissioners voted 5-0 on March 14, 2005, to approve a special use permit that will clear the way for the wallboard plant to operate next to Progress Energy's Roxboro and Mayo plants (Herald-Sun, 2005§[4]).

Mica.—Oglebay Norton Company, a Cleveland, Ohio-based company, announced on April 6, 2005, that its Oglebay Norton Specialty Minerals, Inc. subsidiary has completed the sale of its Kings Mountain, NC, mica operation to King's Mountain Mining LLC, an affiliate of Zemex Corporation for $15 million. The company said it expects to complete the sale of its Velarde, New Mexico, mica facility by yearend 2005. Operations at Velarde have been suspended since September 2004. The company had previously announced its intent to sell all its mica operations as part of its plan to focus on its industrial sands, lime, limestone, limestone fillers, and marine services businesses.

Oglebay-Norton emerged from Chapter 11 bankruptcy on January 31, 2005, pursuant to a plan of reorganization approved by the U.S. Bankruptcy Court for the District of Delaware on November 17, 2004 (Oglebay Norton Co., 2005§).

Zemex Corporation is a leading producer of industrial minerals with facilities across the United States and Canada. Its products are used in a variety of commercial applications and are sold throughout Asia, Europe, North America, and South America. Zemex is based in Atlanta.

CertainTeed Corp. will invest more than $50 million to expand its shingle-manufacturing plant in Granville County, NC, creating 55 jobs during the next 3 years. The new jobs will be manufacturing and assembly positions and will pay an average weekly salary of $670, roughly $35,000 annually.

The company will receive a $300,000 grant from an economic development fund administered by the North Carolina Governor to help pay for the project, which will include a new 6,040-square-meter production wing to be completed in 2007. CertainTeed made specially laminated shingles for commercial and residential buildings and employed 200 people at its Oxford (Granville County) facility. Hiring for the new jobs will begin in late 2005.

CertainTeed is a subsidiary of Paris-based Saint-Gobain Corp., which in 2003 had sales of $27.2 billion, about 8% of which was from CertainTeed (News and Observer, 2004a).

Synthetic Gemstones.—Charles & Colvard, Ltd. signed a distribution deal with J.C. Penney to distribute its moissanite jewels. After a 5-month test, J.C. Penney agreed to sell Charles & Colvard jewelry in 460 of its stores across the Unites States and via its catalogs and Internet site (News and Observer, 2004b). Charles & Colvard expanded its moissanite gem distribution with the announcement that Finlay Enterprises, which leases department store jewelry counters at chains such at Lord & Taylor, Marshall Fields, and Mon-Macy's, agreed to sell the diamondlike stones at 83 additional counters, bringing the total to 114 (News and Observer, 2005c).

[4]References that include a section mark (§) are found in the Internet References Cited section.

Moissanite is a manufactured gemstone that some say is brighter and cheaper than diamonds. During the past 5 years, the Morrisville (North Carolina)-based Charles & Colvard has been able to interest mostly television shopping channels and small regional jewelry retailers. The deal with J.C. Penney provided a national platform for its moissanite. J.C. Penney agreed to sell a wide variety of moissanite jewelry set in 14-karat gold including rings, bracelets and earrings. Financial terms of the deal were not disclosed. The moissanite is grown in a laboratory. The clear stones, which sometimes have a green tint, are shipped to the Far East, where they are cut and polished. They then return to the Triangle (Raleigh-Durham, NC, area) for inspection and grading.

On February 16, 2005, Charles & Colvard announced that it now has a new supplier. A Swedish company will begin supplying Charles & Colvard with some of the raw material it needs to create synthetic jewels. Charles & Colvard agreed to purchase silicon carbide from Norstel AB in a 3-year contract worth at least $4 million. Cree, a Durham chipmaker, had been the sole materials supplier (News and Observer, 2005b).

Environmental Issues, Reclamation, and Technological Achievements

A listing of permitted active and inactive mines in North Carolina is available on the Internet at URL http://www.geology.enr.state.nc.us/Permitted_mines_20041130/Permitted_mines_North_Carolina_Geological_Survey.htm. Links are provided to the Mining Act, Administrative Rules, the North Carolina Mining Commission, staff, and forms.

At its February 2005 meeting, the North Carolina Mining Commission presented the 2005 Mined Land Reclamation Stewardship Award to PCS Phosphate Company, Inc. for its reclamation efforts associated with the restoration of approximately 34 hectares of mined lands along the headwaters of Whitehurst Creek at its Aurora Phosphate Mine in Beaufort County. After being nominated by State officials, PCS Phosphate also won the 2005 Interstate Mining Compact Commission's (IMCC) national reclamation award and has been nominated for competition in the National Association of State Land Reclamationists' (NASLR) Awards Program.

The North Carolina Mining Commission awarded the 2005 Public Outreach/Education and Community Relations Mining Stewardship Award to Hedrick Industries for exceptional efforts at its Grove Stone and Sand Mine in Buncombe County. Grove Stone and Sand Company partnered with the North Carolina Wildlife Federation to educate children and adults about benefits of mining and wildlife enhancement at the Grove Stone and Sand Mine through the Wildlife and Industry Together Program (W.A.I.T.). The W.A.I.T. certification at the mine site includes education programs, wildlife habitat management and protection, community partnership, and W.A.I.T. team functions. After being nominated by State officials, Hedrick Industries also won the 2005 IMCC's national public outreach award and has been nominated for competition in the 2005 NASLR Awards Program.

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Vulcan Construction Materials received an honorable mention in the Community Relations Category for its initiative and considerable efforts in community relations at its Gold Hill Quarry in Cabarrus County.

Government Programs

The NCGS, in collaboration with industry and other groups, will host the Forty-Second Forum on the Geology of Industrial Minerals, which will be held in Asheville, NC, on May 7-13, 2006. A series of field trips are planned in conjunction with the formal sessions to highlight the industrial minerals and their diversity in North Carolina. This is the first time that the Forum will be held in North Carolina. A preliminary program and event schedule was posted on the Forum's Web site at URL http://www.geology.enr.state.nc.us/NCIndustrialMineralsForum/index.htm.

The Mecklenburg Partnership project is a collaborative effort to produce seamless digital topographic maps for the Nation. This prototype involves the NCGS, the USGS, and Mecklenburg County, NC. The product generation's goal is to generate a near-standard USGS 1:24000-scale-content topographic map using information available using data in The National Map (http://nationalmap.gov) and local data. More information on this project is available on the Internet at URL http://mcmcwebmap.usgs.gov.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	2,420	11,900	2,190	10,900	2,260	12,900
Kaolin	W	W	W	4,500	34	764
Feldspar	330 r	17,100	362	18,900	351	20,500
Gemstones	NA	280	NA	279	NA	280
Mica, crude	40 r	3,100	39	9,580	40	9,600
Sand and gravel:						
Construction	10,000	50,700	10,500	55,600	11,500	59,700
Industrial	1,320	25,600	1,530	26,700	1,630	29,000
Stone:						
Crushed	62,900	451,000	67,100	505,000	72,300	548,000
Dimension	41	17,900	47	18,700	43	18,200
Combined values of olivine, phosphate rock, pyrophyllite (crude), and value indicated by symbol W	XX	111,000	XX	84,500	XX	105,000
Total	XX	689,000	XX	734,000	XX	805,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	12	5,540	$38,000	$6.85	12	6,360	$46,200	$7.26	11	6,670	$48,800	$7.32
Dolomite	1	W	W	6.73	1	W	W	6.72	1	W	W	6.72
Calcareous marl	--	--	--	--	--	--	--	--	1	W	W	26.46
Granite	76	48,400	349,000	7.20	78	49,800	378,000	7.60	75	51,800	396,000	7.63
Traprock	7	4,930	36,200	7.34	8	7,050	50,900	7.22	7	7,280	53,500	7.35
Quartzite	2	W	W	8.64	2	W	W	8.95	2	W	W	9.48
Slate	2	W	W	6.72	2	W	W	7.17	2	W	W	7.17
Volcanic cinder and scoria	1	W	W	6.72	1	W	W	7.17	3	W	W	7.77
Miscellaneous stone	2	872	6,200	7.11	2	864	6,470	7.49	2	1,010	7,630	7.59
Total or average	XX	62,900	451,000	7.18	XX	67,100	505,000	7.52	XX	72,300	548,000	7.59

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3a
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	131	$542	$4.14
Riprap and jetty stone	610	7,420	12.16
Filter stone	W	W	11.02
Other coarse aggregates	358	3,710	10.37
Total or average	1,100	11,700	10.62
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,590	26,400	10.19
Bituminous aggregate, coarse	1,880	18,800	10.02
Bituminous surface-treatment aggregate	1,830	18,000	9.85
Railroad ballast	1,200	7,830	6.52
Other graded coarse aggregate	3,300	33,200	10.08
Total or average	10,800	104,000	9.66
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,000	4,410	4.40
Stone sand, bituminous mix or seal	(2)	(2)	8.69
Screening, undesignated	2,150	14,900	6.93
Other fine aggregates	1,520	12,700	8.34
Total or average	4,670	32,000	6.85
Coarse and fine aggregates:			
Graded road base or subbase	6,260	47,100	7.52
Unpaved road surfacing	(3)	(3)	9.04
Terrazzo and exposed aggregate	(3)	(3)	22.04
Crusher run or fill or waste	385	2,950	7.66
Other coarse and fine aggregate	4,360	28,600	6.57
Total or average	11,000	78,700	7.15
Other construction materials	36	400	11.11
Unspecified:[4]			
Reported	36,500	258,000	7.07
Estimated	3,000	20,000	6.59
Total or average	39,500	278,000	7.03
Grand total or average	67,100	505,000	7.52

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b

NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$4.32
Riprap and jetty stone	755	$9,230	12.23
Filter stone	328	3,350	10.22
Other coarse aggregates	304	1,350	4.44
Total or average	1,390	13,900	10.05
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,190	33,500	10.51
Bituminous aggregate, coarse	1,740	18,200	10.46
Bituminous surface-treatment aggregate	1,600	16,100	10.06
Railroad ballast	1,300	8,650	6.66
Other graded coarse aggregates	3,030	30,600	10.11
Total or average	10,800	107,000	9.86
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,090	4,770	4.36
Stone sand, bituminous mix or seal	(2)	(2)	9.15
Screening, undesignated	2,560	18,100	7.10
Other fine aggregates	1,060	9,120	8.63
Total or average	4,710	32,000	6.81
Coarse and fine aggregates:			
Graded road base or subbase	5,840	44,800	7.66
Unpaved road surfacing	149	1,930	12.98
Terrazzo and exposed aggregate	(3)	(3)	7.72
Crusher run or fill or waste	745	6,020	8.08
Other coarse and fine aggregates	4,300	29,800	6.93
Total or average	11,000	82,500	7.48
Unspecified:[4]			
Reported	41,700	294,000	7.06
Estimated	2,600	18,000	7.13
Total or average	44,300	313,000	7.07
Grand total or average	72,300	548,000	7.59

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Other construction materials	36	400	--	--	--	--
Unspecified:[6]						
Reported	2,840	20,000	18,000	129,000	15,700	110,000
Estimated	1,600	9,500	160	1,300	1,200	8,800
Total	11,000	84,500	34,200	259,000	21,900	161,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Reported and estimated production without a breakdown by end use.

TABLE 4b

NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	2,910	21,100	5,840	43,300	2,300	18,000
Unspecified:[6]						
Reported	4,790	35,300	19,600	139,000	17,300	120,000
Estimated	1,200	8,400	200	1,600	1,200	8,400
Total	12,600	97,000	35,700	273,000	24,000	178,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Reported and estimated production without a breakdown by end use.

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TABLE 5a
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,320	$17,400	$5.22
Plaster and gunite sands	23	204	8.87
Concrete products (blocks, bricks, pipe, decorative, etc.)	465	1,920	4.14
Asphaltic concrete aggregates and other bituminous mixtures	536	2,270	4.23
Road base and coverings	303	2,380	7.85
Road and other stabilization (lime)	27	136	5.04
Fill	905	2,670	2.95
Snow and ice control	17	87	5.12
Other miscellaneous uses[2]	49	543	11.08
Unspecified:[3]			
Reported	2,440	15,500	6.37
Estimated	2,400	13,000	5.21
Total or average	10,500	55,600	5.28

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,430	$21,600	$4.87
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	251	1,390	5.56
Asphaltic concrete aggregates and other bituminous mixtures	436	1,780	4.07
Road base and coverings[3]	524	1,450	2.77
Fill	716	1,970	2.74
Snow and ice control	14	90	6.29
Other miscellaneous uses	108	818	7.58
Unspecified:[4]			
Reported	2,060	14,900	7.23
Estimated	2,900	16,000	5.42
Total or average	11,500	59,700	5.22

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sand.
[3]Includes road and other stabilization (lime).
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	933	5,260	2,880	14,200
Asphaltic concrete aggregates and road base materials[4]	524	3,530	342	1,250
Fill	316	809	590	1,860
Other miscellaneous uses[5]	41	450	25	178
Unspecified:[6]				
Reported	1,820	13,000	623	2,550
Estimated	600	3,200	1,800	9,300
Total	4,250	26,200	6,290	29,400

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (lime).
[5]Includes railroad ballast, and snow and ice control.
[6]Reported and estimated production without a breakdown by end use.

TABLE 6b
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	2,120	10,500	2,560	12,400	--	--
Asphaltic concrete aggregates and road base materials[4]	317	1,540	644	1,690	--	--
Fill	253	675	370	959	93	332
Other miscellaneous uses[5]	24	280	66	382	32	247
Unspecified:[6]						
Reported	1,250	11,500	807	3,440	--	--
Estimated	700	4,100	2,200	12,000	--	--
Total	4,670	28,600	6,660	30,600	125	579

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (lime).
[5]Includes snow and ice control.
[6]Reported and estimated production without a breakdown by end use.

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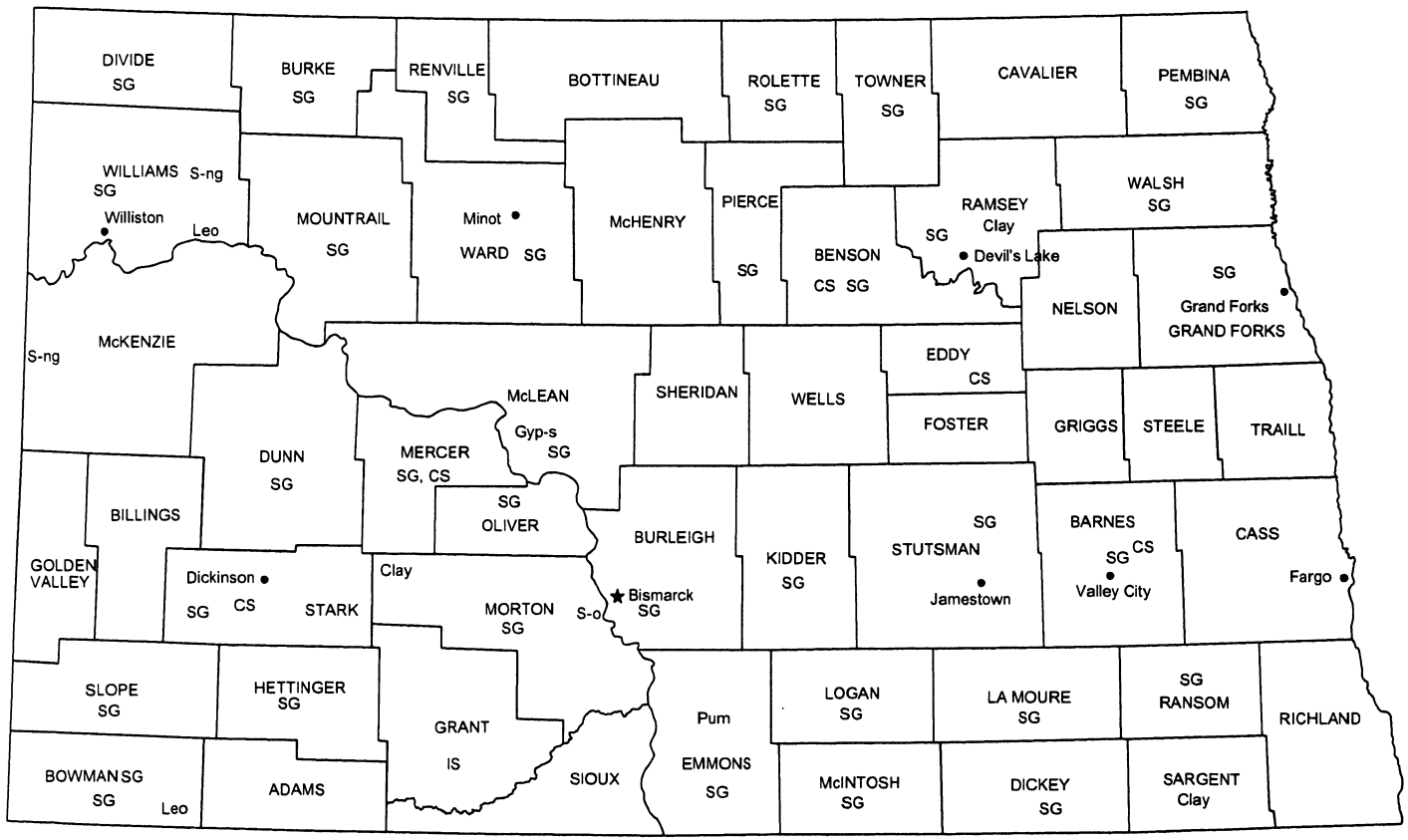
NORTH DAKOTA



LEGEND

- County boundary
- ★ Capital
- • City

MINERAL SYMBOLS

(Major producing areas)

Clay	Common clay
CS	Crushed stone
Gyp-s	Synthetic gypsum
IS	Industrial sand
Leo	Leonardite
Pum	Pumicite
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel

0 50 Kilometers

Source: North Dakota Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF NORTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Dakota Geological Survey for collecting information on all nonfuel minerals.

In 2004, North Dakota's nonfuel raw mineral production was valued[1] at $44.5 million, based upon annual U.S. Geological Survey (USGS) data. This was a 4.3% decrease from the State's total nonfuel mineral value for 2003,[2] which was up more than 27% from 2002.

North Dakota's leading nonfuel mineral by value in 2004 continued to be construction sand and gravel. This high-volume, low-value commodity accounted for nearly three-fourths of the State's nonfuel raw mineral production value. Lime was second by value, and crushed stone was third. In 2004, construction sand and gravel production decreased by slightly more than 13%, accounting for an 8.6%, or $3.1 million, decrease in value, the largest and most significant decrease for the year (table 1). With an increase in production, the value of crushed stone showed a significant increase, and the value of lime was up, slightly. The value of gemstones was unchanged, and industrial sand and gravel value showed a small decrease.

In 2003, a 26% increase in construction sand and gravel production accounted for an $8 million rise in its value; smaller yet significant increases also took place in the values of lime, industrial sand and gravel, and common clays (descending order of change).

The following narrative information was provided by the North Dakota Geological Survey[3] (NDGS). Production data in the text that follows are those reported by the NDGS based upon that agency's own surveys and estimates.

Commodity Review

Industrial Minerals

During 2004, 16 surface mining operators in North Dakota reported information to the North Dakota State Soil Conservation Committee (SSCC). (The SSCC collects production data by volume, unlike the USGS, which collects data by mass or metric tons produced.) Based upon these reports, 104 hectares (ha) was affected by these operations. The quantity of minerals mined included 2.02 million cubic meters (m^3) of sand and gravel, 83,000 m^3 of clay, 97,000 m^3 of scoria, and 57,000 m^3 of crushed stone for a total of 2.26 million m^3 of mined mineral material. From 60 pits, ranging in size from more than 0.1 ha to 16 ha, a total of 351,000 m^3 of overburden was disturbed.

Common Clays.—Most of the clay mined in North Dakota during this period (about 80%, or 66,000 m3) was mined by the Hebron Brick Co. to produce brick, and one-third to one-half of the clay mined for the manufacture of brick was kaolinite. In 2002, more than one-half of the clay produced in North Dakota was used to construct dikes and raise roads in the flooded area of Devils Lake. In 2004, about 20% (16,000 m^3) of the clay was mined for this purpose.

Leonardite.—Leonardite is an oxidized lignite. Currently, Georesources, Inc. of Williston and American Colloid Co. of Scranton are the only leonardite mining operations in North Dakota. The two companies produced a combined total of approximately 60,000 metric tons (t) of leonardite in 2004, a 17% decrease from 2003. Leonardite is processed and used as a dispersant and viscosity control in oil well drilling muds, as a stabilizer for ion-exchange resins in water treatment, and as a soil conditioner.

Pumice and Pumicite.—Volcanic ash (pumicite) has been mined intermittently from a deposit in the Linton area since 1970. In 2004, less than 100 t was mined by NURTURE, Inc., a Minneapolis-based company that produces and distributes an increasing line of volcanic ash-base products. The NDGS recently estimated that this deposit contains about one billion metric tons of pumicite.

Other Industrial Minerals.—The coal gasification plant located near Beulah continued to operate an anhydrous ammonia plant. The ammonia plant, in operation since spring 1997, has the capacity to produce about 1,200 metric tons per day (t/d) of anhydrous ammonia. The plant averaged 535 t/d (340 operating days per year) during 2004; the total production of anhydrous ammonia in 2004 was 182,000 t. In 2004, the gasification plant also produced more than 2.6 million liters (ML) of krypton and xenon; approximately 10.1 ML of phenol; 10.7 ML of cresylic acid; 32.3 ML of naptha; and about 1.7 ML of nitrogen. Ammonium sulfate production from the stack gas scrubber was 81,800 t. In 2004, the plant shipped more than 30,400 million standard cubic feet (860 million m3) of carbon dioxide for use in enhanced oil field recovery.

Legislation and Government Programs

The SSCC, as designated by the State legislature, continued to administer the Surface Mining Report Law, which required any person conducting surface mining operations for minerals other than coal to comply with the reporting requirements of North Dakota Century Code Chapter 38-16. Minerals included under the law are cement rock, clay, gravel, limestone, manganese, molybdenum, peat, potash, pumicite, salt, sand, scoria, sodium sulfate, stone, zeolite, or other minerals except coal. The

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Edward C. Murphy, State Geologist, authored the text of State mineral industry information provided by the North Dakota Geological Survey.

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SSCC has the regulatory authority to administer the reporting requirement, while the actual regulatory authority for most of these mining activities rests with the North Dakota Geological Survey. The law requires that any person or company that within one calendar year removes 7,650 cubic meters (10,000 cubic yards) or more of earthen materials or products (including overburden) affecting 0.2 hectare (one-half acre) or more in combined mining operations must report the particulars of its surface mining activities. Some operators of smaller operations cooperate by voluntarily submitting summary reports to the SSCC. Nevertheless, because not all operations report, the summary of surface mining statistics presented by the NGDS is a conservative estimate of the amount of nonfuel minerals mined in North Dakota in 2004.

The NDGS maintains a minerals page on its Web site at URL http://www.state.nd.us/ndgs/minerals/minerals.htm, in particular for the nonfuel raw mineral commodities of cement, clay, rock salt, sand and gravel, volcanic ash, and the fuel minerals coal, petroleum, and uranium.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH DAKOTA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	57	W	W	W	W	186
Gemstones	NA	4	NA	4	NA	4
Sand and gravel, construction	10,700	27,900	13,500	35,900	11,700	32,800
Combined values of lime, sand and gravel (industrial), stone [crushed granite, limestone, volcanic cinder, and miscellaneous (2002), crushed limestone, volcanic cinder, miscellaneous (2003)], crushed granite, scoria, traprock, volcanic cinder, miscellaneous (2004)], and values indicated by symbol W	XX	8,540	XX	10,600	XX	11,500
Total	XX	36,500	XX	46,500	XX	44,500

NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
NORTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	--[r]	--[r]	--[r]	--[r]	1	W	W	$13.93	--	--	--	--
Granite	1	W	W	$8.82	--	--	--	--	1	W	W	$4.41
Traprock	--	--	--	--	--	--	--	--	1	W	W	4.41
Volcanic cinder and scoria	2	W	W	3.55	1	W	W	3.64	1	W	W	3.64
Miscellaneous stone	5	W	W	4.34	1	W	W	3.64	4	W	W	4.23
Total or average	XX	W	W	5.31[r]	XX	W	W	4.44	XX	W	W	3.97

[r]Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

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TABLE 3a

NORTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	$8.78
Coarse aggregate, graded:			
Bituminous aggregate (coarse)	W	W	5.51
Railroad ballast	W	W	4.03
Fine aggregate (-⅜ inch), stone sand (bituminous mix or seal)	W	W	3.75
Coarse and fine aggregates, graded road base or subbase	W	W	3.79
Other miscellaneous uses and specified uses not listed	4	$16	4.00
Unspecified, reported[2]	119	519	4.37
Total or average	W	W	4.44

W Withheld to avoid disclosing company proprietary data.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Reported production without a breakdown by end use.

TABLE 3b

NORTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate, graded, concrete aggregate (coarse)	W	W	$4.41
Coarse and fine aggregates, graded road base or subbase	W	W	4.41
Unspecified, reported[2]	280	$1,090	3.90
Total or average	W	W	3.97

W Withheld to avoid disclosing company proprietary data.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Reported production without a breakdown by end use.

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TABLE 4a
NORTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	318	$2,030	$6.39
Asphaltic concrete aggregates and other bituminous mixtures	272	899	3.31
Road base and coverings	2,170	4,770	2.19
Fill	183	330	1.80
Snow and ice control	10	32	3.20
Railroad ballast	5	24	4.80
Unspecified:[2]			
Reported	1,910	4,860	2.55
Estimated	8,700	23,000	2.65
Total or average	13,500	35,900	2.66

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4b
NORTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	312	$2,030	$6.51
Asphaltic concrete aggregates and other bituminous mixtures	306	1,040	3.41
Road base and coverings	2,120	6,180	2.91
Fill	191	337	1.76
Other miscellaneous uses[2]	15	90	6.18
Unspecified:[3]			
Reported	2,760	7,300	2.64
Estimated	6,000	16,000	2.63
Total or average	11,700	32,800	2.80

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes railroad ballast and snow and ice control.
[3]Reported and estimated production without a breakdown by end use.

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OHIO

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major Producing areas)

Al	Aluminum plant
Be	Beryllium plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
DS	Dimension stone
FA	Ferroalloys plant
FC	Fire clay
Gyp	Gypsum
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Mn	Manganese dioxide plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Si	Silicon metal plant
Steel	Steel plant
TiMet	Titanium metal plant
Vm	Vermiculite
◯	Concentration of mineral operations

Source: Ohio Division of Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF OHIO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Ohio Department of Natural Resources, Division of Geological Survey, for collecting information on all nonfuel minerals.

In 2004, Ohio's nonfuel raw mineral production was valued[1] at $1.12 billion, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 11% increase from the State's total nonfuel mineral value for 2003,[2] which was up 4.1% from 2002. The State remained 13th in rank among the 50 States in total nonfuel raw mineral production value and accounted for about 2.5% of the U.S. total value.

Crushed stone by value remained Ohio's leading nonfuel mineral, followed by construction sand and gravel, salt (proprietary data), lime, cement (portland and masonry), and industrial sand and gravel (in descending order of value). Crushed stone and construction sand and gravel accounted for about 58% of the State's total nonfuel mineral value. Virtually all the State's mineral commodities rose in value in 2004. Crushed stone and construction sand and gravel led with increases of $46 million and $21 million, respectively, followed by increases in lime, value up $13 million, portland cement, up $3.5 million, and industrial sand and gravel, up $2.1 million (table 1). With a significant increase in production, the value of salt also was up substantially. Gains also were made in the production and value of masonry cement.

In 2003, a 15% increase in the production of lime resulted in a $16 million rise in the commodity's value from 2002. Although the production of crushed stone was down about 2%, its value rose by $13 million. Smaller yet significant increases also took place in the values of industrial sand and gravel and masonry and portland cement (descending order of change). The only substantial decrease in value for a nonfuel mineral resulted from a decrease in the production of construction sand and gravel, value down $8 million (table 1). Similar to 2004, a significant increase in production of salt led to an increase in its value.

In 2004, Ohio continued to rank fourth among producing States in the quantities of salt and lime produced and sixth in construction sand and gravel. The State rose to second from third in the production of fire clays, to sixth from seventh in crushed stone and was a significant producer of portland cement, masonry cement, and dimension stone (descending order of value). It decreased to 5th from 4th in common clays and to 10th from 9th in industrial sand and gravel.

Ohio's mines produced only industrial minerals and coal; metals produced in the State were processed from materials received from other domestic and foreign sources. In 2004, the State continued to be the Nation's second leading raw steel-manufacturing State with an estimated output of about 14.3 million metric tons (Mt), as reported by the American Iron and Steel Institute (2005, p. 76), as well as second in the production of primary aluminum.

The Ohio Department of Natural Resources, Division of Geological Survey[3] (ODGS), provided the following narrative information, based upon its own surveys, estimates, and data that it acquired from other State agencies.

In 2004, Ohio's total combined nonfuel mineral production was 131.5 Mt, a 5.8% increase from 2003. Limestone and dolomite production and value set an alltime record in 2004; salt, clay, and shale production were up significantly compared with 2003. The total value of industrial minerals produced in Ohio during 2004, not including cement or gemstones, was $920.1 million. The Ohio nonfuel-mineral industry employed more than 5,500 people during 2004.

Commodity Review

Industrial Minerals

Clay and Shale.—Ohio's clay and shale industry continues to thrive, increasing production more than 15% in 2004. Belden Brick Co. is the leading producer of building brick in the State; its seven plants in Tuscarawas County have the capacity to produce 225 million bricks per year. Several other operators produce millions of additional bricks at plants located in Columbiana, Harrison, Licking, and Marion Counties. Proservices USA acquired Richland Moulded Brick Co. (Richland County) in June 2004 and renamed the enterprise Artisan Moulded Brick. Artisan plans to update equipment and boost production to 27 million bricks a year. Cement manufacture and lightweight-aggregate applications continue to use large quantities of Ohio clay and shale.

Crushed Stone.—The State's 114 active quarries produced 74.8 Mt of limestone and dolomite in 2004. Ohio's largest limestone quarry in 2004 was the Columbus Limestone quarry operated by Shelly Materials Inc. (Franklin County). This quarry produced 4.6 Mt of aggregate from the Devonian-age Columbus Limestone. Two additional quarries located in Delaware and Ottawa Counties produced in excess of 4 Mt of limestone and/or dolomite during 2004. National Lime and Stone Co. again led the State in limestone and dolomite production (12.9 Mt) from 8 plants.

Industrial Sand.—Ohio has an abundance of high-silica sandstones that can be used for glass manufacture and other

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Mark Wolfe, a Geologist with the Ohio Division of Geological Survey, authored the text of the State mineral industry information provided by that State agency.

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industrial applications. Best Sand Corp. produced 709,000 metric tons (t) of industrial sand from the Pennsylvanian-age Sharon conglomerate in Geauga County during 2004. Ogleby Norton Industrial Sands, Inc. produced more than 275,000 t of high-silica sand from operations in Knox and Perry Counties. Production came from the Mississippian-age Black Hand Sandstone and Pennsylvanian-age Massillon sandstone, respectively.

Sand and Gravel.—The largest sand and gravel operation in 2004 was Olen Corp.'s Columbus Plant, which produced 2.3 Mt of aggregate from glacial outwash and kame terraces in southern Franklin County. Three other operations located in Butler and Hamilton Counties produced greater than 1 Mt in 2004; several pits located throughout the State each produced more than 500,000 t sand and gravel. Martin Marietta Aggregates led the State in sand and gravel production (8.1 Mt). The majority of Ohio's 293 active sand and gravel operations are small to medium in size, and serve local markets.

Merger and acquisition activity in the Ohio aggregate industry continued to be robust in 2004. Barrett Paving Materials Inc., Lafarge North America, Olen Corp., and Shelly Materials, Inc. completed major acquisitions.

Government Programs

The Report on Ohio Mineral Industries, prepared annually by the Ohio Division of Geological Survey, is available online at URL http://www.ohiodnr.com/geosurvey/. The Report contains detailed production, employment, and geologic information on each industrial mineral operation in the State. A Web-base GIS version of the Ohio mineral industries map allows a user to directly access a summary of industrial minerals information by permitted operation.

Reference Cited

American Iron and Steel Institute, 2005, Pig iron and raw steel production-Final 2004, AIS-7, subsection of Annual statistical report 2004: Washington, DC, American Iron and Steel Institute, 130 p.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OHIO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	W	W	W	W	98	13,000 e
Portland	1,020	78,000 e	1,030	82,200 e	1,020	85,700 e
Clays:						
Common	1,310	7,820	1,440	7,430	1,360	7,480
Fire	W	W	W	W	42	W
Gemstones	NA	4	NA	4	NA	4
Lime	1,630	98,100	1,880	114,000	1,880	127,000
Sand and gravel:						
Construction	48,700	250,000	47,300	242,000	50,800	263,000
Industrial	1,000	28,900	1,120	32,100	1,180	34,200
Stone:						
Crushed	72,000 r	326,000 r	70,500	339,000	76,400	385,000
Dimension	30	4,990	30	5,090	38	5,100
Combined values of gypsum [crude (2002)], peat, salt, and values indicated by symbol W	XX	176,000	XX	188,000	XX	197,000
Total	XX	970,000 r	XX	1,010,000	XX	1,120,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
OHIO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	95 r	64,900 r	$292,000 r	$4.50 r	91	61,500	$301,000	$4.89	93	69,400	$354,000	$5.11
Dolomite	8 r	6,760 r	32,600 r	4.82 r	9	8,610	35,800	4.16	8	6,570	28,000	4.26
Sandstone	3 r	385	1,640	4.25	4	377	1,950	5.18	4	467	2,490	5.34
Total or average	XX	72,000 r	326,000 r	4.53	XX	70,500	339,000	4.80	XX	76,400	385,000	5.03

rRevised. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes "limestone-dolomite" reported with no distinction between the two.

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TABLE 3a

OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.37
Riprap and jetty stone	427	$2,820	6.60
Filter stone	43	271	6.30
Other coarse aggregates	410	2,720	6.64
Total or average	880	5,810	6.61
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,240	18,400	5.69
Bituminous aggregate, coarse	1,870	11,300	6.02
Bituminous surface-treatment aggregate	585	5,010	8.56
Railroad ballast	197	1,000	5.09
Other graded coarse aggregates	1,300	7,210	5.57
Total or average	7,190	42,900	5.97
Fine aggregate (-⅜ inch):			
Stone sand, concrete	135	682	5.05
Stone sand, bituminous mix or seal	421	2,080	4.95
Screening, undesignated	92	223	2.42
Other fine aggregates	373	1,410	3.78
Total or average	1,020	4,400	4.31
Coarse and fine aggregates:			
Graded road base or subbase	8,040	38,400	4.78
Unpaved road surfacing	1,520	7,040	4.63
Crusher run or fill or waste	1,750	8,770	5.01
Other coarse and fine aggregates	1,710	7,990	4.66
Total or average	13,000	62,200	4.78
Other construction materials	1,960	10,100	5.15
Agricultural, limestone	481	2,770	5.75
Chemical and metallurgical:			
Cement manufacture	4,590	24,700	5.40
Lime manufacture	(2)	(2)	2.50
Flux stone	178	875	4.92
Glass manufacture	(2)	(2)	6.28
Total or average	6,830	32,000	4.68
Special:			
Asphalt fillers or extenders	(2)	(2)	5.51
Whiting or whiting substitute	(2)	(2)	12.13
Other fillers or extenders	(2)	(2)	5.53
Total or average	364	2,230	6.13
Other miscellaneous uses and specified uses not listed	5,360	28,500	5.32
Unspecified:[3]			
Reported	29,000	129,000	4.44
Estimated	4,400	19,000	4.30
Total or average	33,400	148,000	4.42
Grand total or average	70,500	339,000	4.80

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	2,480	$12,800	$5.18
Filter stone	40	278	6.95
Other coarse aggregates	136	1,040	7.64
Total or average	2,660	14,200	5.33
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,030	14,900	4.94
Bituminous aggregate, coarse	1,960	11,300	5.75
Bituminous surface-treatment aggregate	221	1,370	6.18
Railroad ballast	267	1,230	4.61
Other graded coarse aggregates	1,270	6,950	5.47
Total or average	6,740	35,800	5.30
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	4.26
Stone sand, bituminous mix or seal	570	2,890	5.07
Screening, undesignated	51	185	3.63
Other fine aggregates	537	3,190	5.95
Total or average	1,160	6,270	5.41
Coarse and fine aggregates:			
Graded road base or subbase	4,910	26,000	5.29
Unpaved road surfacing	1,470	6,420	4.37
Crusher run or fill or waste	674	3,320	4.92
Other coarse and fine aggregates	1,610	8,170	5.09
Total or average	8,660	43,900	5.07
Other construction materials	2,020	11,200	5.54
Agricultural, limestone	633	3,520	5.56
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	5.98
Lime manufacture	(2)	(2)	3.99
Flux stone	150	838	5.59
Glass manufacture	(2)	(2)	7.17
Total or average	7,130	38,200	5.37
Special:			
Asphalt fillers or extenders	(2)	(2)	5.51
Whiting or whiting substitute	(2)	(2)	12.13
Other fillers or extenders	(2)	(2)	5.82
Total or average	373	2,420	6.48
Other miscellaneous uses and specified uses not listed	6,210	36,300	5.84
Unspecified:[3]			
Reported	37,600	178,000	4.73
Estimated	3,200	15,000	4.64
Total or average	40,800	193,000	4.73
Grand total or average	76,400	385,000	5.03

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	198	1,110	W	W
Coarse aggregate, graded[3]	4,850	27,100	1,070	8,540	880	4,840	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	112	505	27	166
Coarse and fine aggregate[5]	5,460	22,400	W	W	2,010	10,000	W	W
Other construction materials	935	4,530	415	2,190	183	962	417	2,370
Agricultural[6]	177	967	W	W	W	W	W	W
Chemical and metallurgical[7]	3,820	16,000	W	W	W	W	W	W
Special[8]	W	W	W	W	W	W	--	--
Other miscellaneous uses	1,520	7,760	907	4,800	409	2,080	2,460	13,500
Unspecified:[9]								
Reported	8,280	39,400	6,380	26,400	3,420	15,400	3,360	16,000
Estimated	3,400	14,000	--	--	570	2,500	--	--
Total	29,500	138,000	11,700	58,200	8,920	43,500	8,070	42,100

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	1,970	9,150	1,720	10,500	--	--
Other construction materials	5	24	--	--	--	--
Agricultural[6]	W	W	83	632	--	--
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses	--	--	51	311	--	--
Unspecified:[9]						
Reported	2,260	9,360	4,920	20,700	328	1,250
Estimated	50	230	461	2,000	--	--
Total	4,430	19,700	7,530	35,900	328	1,250

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, flux stone, lime manufacture, and glass manufacture.

[8]Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers and extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	2,240	11,100	197	1,560	W	W	W	W
Coarse aggregate, graded[3]	4,220	18,800	965	8,080	997	5,400	W	W
Fine aggregate (-⅜ inch)[4]	422	2,030	471	2,710	W	W	--	--
Coarse and fine aggregate[5]	2,950	12,000	W	W	2,390	12,300	W	W
Other construction materials	1,030	5,390	396	2,150	101	452	497	3,180
Agricultural[6]	W	W	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	W	W	W	W
Special[8]	W	W	W	W	W	W	--	--
Other miscellaneous uses	1,700	9,550	1,230	6,680	472	2,500	2,770	17,300
Unspecified:[9]								
Reported	9,970	54,900	8,010	36,200	4,820	21,700	8,220	37,300
Estimated	1,600	7,800	300	1,600	670	2,900	--	--
Total	28,500	144,000	13,000	67,300	10,700	52,100	13,400	70,100

	District 5		District 6		Unspecified district	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	W	W	1,510	9,660	--	--
Other construction materials	--	--	--	--	--	--
Agricultural[6]	W	W	W	W	--	--
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses	--	--	35	231	--	--
Unspecified:[9]						
Reported	1,620	6,750	4,740	20,300	256	973
Estimated	70	320	530	2,300	--	--
Total	3,250	14,800	7,310	35,600	256	973

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, flux stone, lime manufacture, and glass manufacture.

[8]Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers and extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,210	$40,000	$4.88
Plaster and gunite sands	84	911	10.85
Concrete products (blocks, bricks, pipe, decorative, etc.)	616	3,440	5.59
Asphaltic concrete aggregates and other bituminous mixtures	3,370	16,300	4.84
Road base and coverings	1,870	10,800	5.81
Road stabilization (cement)	157	896	5.71
Fill	4,870	24,800	5.09
Snow and ice control	138	630	4.57
Filtration	91	520	5.71
Other miscellaneous uses[2]	744	4,150	5.57
Unspecified:[3]			
Reported	23,100	120,000	5.18
Estimated	4,100	20,000	4.95
Total or average	47,300	242,000	5.13

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes roofing granules.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,680	$33,200	$4.96
Plaster and gunite sands	161	1,390	8.66
Concrete products (blocks, bricks, pipe, decorative, etc.)	98	634	6.44
Asphaltic concrete aggregates and other bituminous mixtures	2,590	13,100	5.08
Road base and coverings	1,830	10,400	5.70
Road stabilization (cement)	98	452	4.60
Fill	3,200	15,800	4.93
Snow and ice control	149	774	5.18
Roofing granules	26	313	11.81
Filtration	54	314	5.79
Other miscellaneous uses[2]	822	5,200	6.33
Unspecified:[3]			
Reported	23,500	123,000	5.24
Estimated	12,000	59,000	5.06
Total or average	50,800	263,000	5.19

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	485	2,530	2,540	13,200	1,590	7,870
Asphaltic concrete aggregates and other bituminous mixtures	W	W	1,070	5,550	W	W
Road base and coverings[3]	132	642	665	3,980	449	2,740
Fill	274	1,090	925	5,390	1,240	4,460
Other miscellaneous uses[4]	241	1,370	227	1,590	582	3,030
Unspecified:[5]						
Reported	--	--	3,360	18,800	11,800	59,300
Estimated	100	500	1,500	7,300	1,100	5,800
Total	1,230	6,100	10,300	55,700	16,800	83,200

Use	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,630	8,770	1,720	7,260	949	4,820
Asphaltic concrete aggregates and other bituminous mixtures	438	2,180	1,030	4,090	314	1,720
Road base and coverings[3]	W	W	405	2,210	W	W
Fill	1,790	10,700	465	2,270	177	844
Other miscellaneous uses[4]	501	2,650	171	698	151	901
Unspecified:[5]						
Reported	--	--	4,690	25,900	3,250	15,600
Estimated	--	--	1,100	5,200	300	1,500
Total	4,360	24,300	9,540	47,600	5,130	25,400

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration, roofing granules, and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	431	2,250	2,090	10,500	2,310	10,900
Plaster and gunite sands	W	W	71	403	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	429	2,040	592	3,330	637	2,950
Road base and coverings[2]	W	W	374	2,300	473	2,800
Fill	381	2,100	957	5,500	1,460	5,990
Snow and ice control	--	--	W	W	44	273
Other miscellaneous uses[3]	339	1,760	202	1,370	197	1,840
Unspecified:[4]						
Reported	--	--	3,840	21,200	9,070	45,800
Estimated	70	360	3,800	20,000	2,500	13,000
Total	1,650	8,510	11,900	64,500	16,700	83,700

Use	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	318	2,070	618	2,890	917	4,500
Plaster and gunite sands	W	W	--	--	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	--	--	26	175
Asphaltic concrete aggregates and other bituminous mixtures	W	W	508	2,580	W	W
Road base and coverings[2]	W	W	457	2,400	W	W
Fill	261	1,670	69	266	73	263
Snow and ice control	W	W	38	136	30	171
Other miscellaneous uses[3]	582	3,850	356	1,670	473	2,600
Unspecified:[4]						
Reported	1,510	7,850	4,510	24,400	4,530	23,700
Estimated	2,800	14,000	2,100	9,300	340	1,800
Total	5,520	29,900	8,710	43,600	6,390	33,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes filtration, railroad ballast, and roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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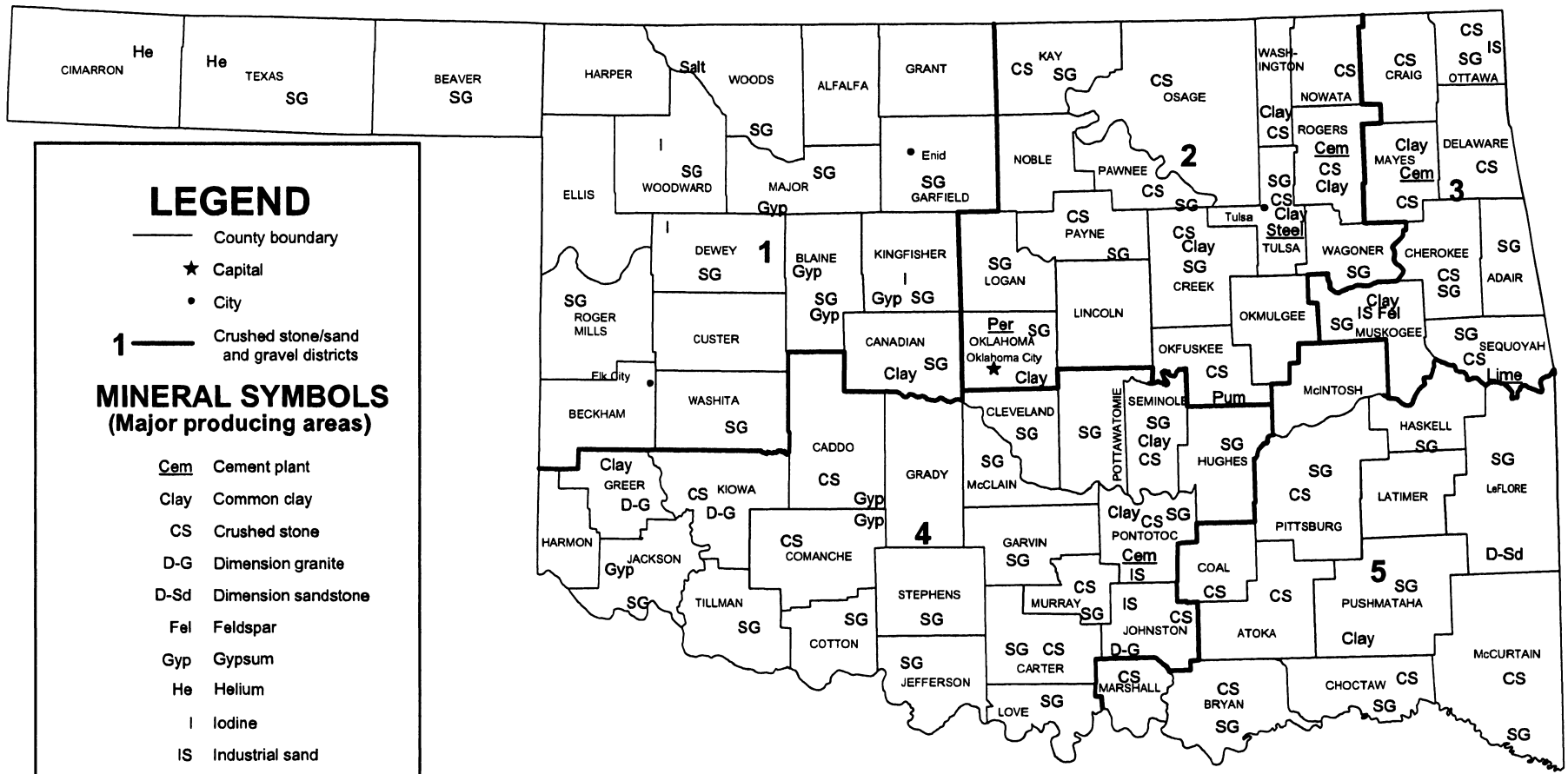
OKLAHOMA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-Sd	Dimension sandstone
Fel	Feldspar
Gyp	Gypsum
He	Helium
I	Iodine
IS	Industrial sand
Lime	Lime plant
Per	Perlite plant
Pum	Pumice and pumicite
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant

Source: Oklahoma Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF OKLAHOMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Oklahoma Geological Survey for collecting information on all nonfuel minerals.

In 2004, Oklahoma's nonfuel raw mineral production was valued[1] at $507 million, based upon annual U.S. Geological Survey (USGS) data. This was a 7.9% increase from 2003,[2] which was down less than 1% from 2002. The State was 31st in rank (29th in 2003) among the 50 States in total nonfuel mineral production value, of which Oklahoma accounted for more than 1% of the U.S. total value.

In 2004, crushed stone continued to be Oklahoma's leading nonfuel mineral commodity, based upon value, accounting for nearly two-fifths of the State's total nonfuel mineral production value. Crushed stone was followed by cement (portland and masonry), construction sand and gravel, industrial sand and gravel, gypsum, and iodine (descending order of value). The combined values of three of Oklahoma's four major construction materials—crushed stone, construction sand and gravel, and gypsum (descending order of value)—accounted for about 53% of the State's total value. (Data for cement were withheld to avoid disclosing company proprietary data.)

Most of Oklahoma's increase in value in 2004 resulted from increases in the production of portland cement, gypsum, and construction sand and gravel, the values of which rose $14 million, nearly $7 million, and about $5 million, respectively. Smaller yet significant increases in value took place in masonry cement, Grade-A helium, crushed stone, and industrial sand and gravel (descending order of change). Relatively few commodities had decreases in value, the largest of which was in that of gemstones, down $193,000 (table 1).

In 2003, increases in the production of construction sand and gravel and cement (masonry and portland) accounted for the largest increases in value, up about $7 million and about $4 million, respectively. Also showing increases in value were lime and industrial sand and gravel, up about $2 million each. But decreases in the production and the related values of iodine, down $5.7 million, gypsum, down $4.4 million, and Grade-A helium and crushed stone, down about $3 million each, resulted in the State's small overall decrease in nonfuel mineral value for the year (table 1).

Oklahoma's mines exclusively produced industrial minerals; no metals were mined in the State. In 2004, Oklahoma continued to be the only State that produced iodine, and it remained second of 4 States that produce tripoli, seventh (though tied with another State) in the quantities of common clays produced, and eighth in industrial sand and gravel. Oklahoma regained its characteristic ranking of first in gypsum (second in 2003) and rose to fourth from fifth in feldspar. Additionally, the State continued to be a significant producer of crushed stone, portland cement, construction sand and gravel, and masonry cement (descending order of value).

The narrative information that follows was provided by the Oklahoma Geological Survey[3] (OGS). Production data in the text that follows are those reported by the OGS based upon that agency's own surveys and estimates. Data may differ from some production figures or other data as reported to the USGS.

Mining Employment

The Oklahoma Department of Mines recorded that 342 mine operators produced nonfuel minerals from 391 mines in the State of Oklahoma in 2004; however, a total of 499 permitted mining operations. Almost all were open pit mines with the exception being salt and iodine produced from brine wells, helium produced from natural gas wells, and one underground limestone mine. The mining industry in Oklahoma directly employed 27,007 persons in 2004; this does not include those employed by iodine and helium operators.

In 2004, the Oklahoma Miner Training Institute (OMTI) held 310 classes for a total of 21,208 classroom hours of instruction in which 89 coal miners and 4,515 metal/nonmetal miners were trained. The OMTI operates under the direction of the Oklahoma Mining Commission. The OMTI resides at Eastern Oklahoma State College in Wilburton, Oklahoma, and provides mine safety and health classes. Classes are held on a regular schedule at the college or at mine sites throughout the State for the convenience of miners and operators. All training provided by the OMTI is free of charge to mining companies who hold mining permits in Oklahoma.

Commodity Review

Industrial Minerals

Dimension Stone.—Continued demand for dimension stone products in Oklahoma and across the United States increased and continued to influence stone production, particularly in LeFlore and Haskell Counties. Growth in residential housing markets was responsible for much of this increase. Products in demand included building stone, decorative stone, field stone, flagstone, and natural stone landscaping products. Limestone, granite, and sandstone were the principal resources mined in Oklahoma for these products.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Stanley T. Krukowski, Industrial Minerals Geologist III with the Oklahoma Geological Survey, authored the text of the State mineral industry information provided by that agency.

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Iodine.—Iodine was produced from oil field brines in the northwestern quadrant of Oklahoma from deep wells in the Anadarko basin. The Woodward trench, a south-trending paleovalley in the Morrowan (basal Pennsylvanian) sandstones, contained brines with iodine concentrations as high as 700 parts per million (ppm). Two companies operated their own production wells and plant facilities, processing subsurface brines to produce iodine—Woodward Iodine Corporation, in Woodward County and Iochem Corporation in Dewey County.

A third company, North American Brine Resources (NABR) in Kingfisher County, operated a miniplant that served as an oilfield-injection-disposal site. NABR collected oilfield brines from a number of producing oil and gas wells in nearby northwestern Oklahoma, then extracted iodine from the brines, and finally injected the brines into wells at the plant site for disposal. In 2004, NABR completed the dismantling of its iodine production facility in Woodward County.

In 2004, Brine Electric, Inc. was founded to support the iodine industry in two ways. The first was to generate electricity by recovering geothermal energy from subsurface brines used as feedstock for iodine production. Brine temperatures at the wellhead were near or above 80° C (176° F). To process brine cost effectively, the temperature must range between 35° C and 40° C. Thermal energy was lost from the feedstock brine during the cooling phase prior to iodine production. Brine Electric planned to apply commercial technology that used the Kalina cycle to recover low-level thermal energy for power generation. Others participating in the Brine Electric power generation project included Iochem Corp. (Oklahoma City, OK); Nathaniel Energy (Denver, CO); Northwestern Electric Power Cooperative (Woodward, OK); and OG&E and High Plains Resource Conservation and Development (Buffalo, OK). Plans were to develop a 1 to 2 megawatt demonstration plant near Vici, OK, during the next few years.

Brine Electric's second phase called for designing mobile ion exchange units that could extract iodine from production wells, reinjection wells, or other spent-brine sources from current iodine producers. The basic concept was to extract iodine at remote sites, and ship the iodine concentrates for processing at some central production facility. Brine Electric estimated that field trials could begin 2006.

Lime.—Oglebay Norton Co. (owner of Global Stone Corporation) filed for Chapter 11 bankruptcy protection on February 23, 2004, in order to pursue a financial restructuring to reduce Oglebay's indebtedness and to provide more financial flexibility. Global Stone's St. Claire lime plant in Marble City, OK, produced quicklime, hydrated lime, and chemical grade limestone (including ground calcium carbonate). The lime operation was for sale in 2003, but Oglebay rescinded the decision to sell in early 2004. A U.S. bankruptcy court approved the company's reorganization plan in November 2004, and the company officially emerged from bankruptcy protection on January 31, 2005.

Government Programs

The Oklahoma Geological Survey (OGS) continued work on the USGS-sponsored STATEMAP program (http://www.ogs.ou.edu/geolmapping/statemap/index.htm). The following 7.5-minute quadrangles, which represent the Oklahoma City metropolitan area, were completed in 2004—Arcadia (OGQ-55), Bethany (OGQ-48), Bethany NE (OGQ-53), Britton (OGQ-49), Choctaw (OGQ-47), Edmond (OGQ-54), Jones (OGQ-51), Midwest City (OGQ-46), Mustang (OGQ-45), Piedmont (OGQ-52), and Spencer (OGQ-50). The focus of the geologic mapping project included environmental, engineering, and natural resource issues. The maps were published as Open-File Reports and were available through OGS Publication Sales (http://www.ogs.ou.edu/pubs.php).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OKLAHOMA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays, common		1,030	2,250	1,160	2,390	1,150	2,410
Gemstones		NA	197	NA	197	NA	4
Gypsum, crude		2,520	18,500	2,250	14,100	3,250	20,800
Iodine, crude	metric tons	1,420	21,600	1,090	15,900	1,130	15,900
Sand and gravel:							
Construction		10,200	41,300	11,000	48,500	12,000	53,700
Industrial		1,320	28,400	1,360	29,700	1,390	31,600
Stone:							
Crushed		45,000	196,000	40,100	193,000	40,200	195,000
Dimension		17	2,100	17	2,100	17	2,100
Tripoli	metric tons	12,700	2,290	10,600	1,960	32,100	2,120
Combined values of cement, feldspar, helium [crude (2002)], Grade-A], lime, salt		XX	160,000	XX	163,000	XX	183,000
Total		XX	473,000	XX	470,000	XX	507,000

NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
OKLAHOMA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone[2]	41	35,500	$151,000	$4.26	41	33,300	$163,000	$4.90	43	33,500	$163,000	$4.85
Dolomite	1	W	W	5.00	1	W	W	4.85	--	--	--	--
Granite	5	5,500	20,700	3.76	4	3,170	12,900	4.06	4	W	W	5.02
Sandstone and quartzite	8	3,300	19,900	6.05	8	3,030	14,000	4.63	6	2,620	11,400	4.37
Miscellaneous stone	1	W	W	3.74	1	W	W	3.11	2	W	W	4.94
Total or average	XX	45,000	196,000	4.34	XX	40,100	193,000	4.80	XX	40,200	195,000	4.84

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3a
OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	496	$3,420	$6.90
Filter stone	136	909	6.70
Other coarse aggregates	328	1,570	4.79
Total or average	960	5,900	6.15
Coarse aggregate, graded:			
Concrete aggregate, coarse	937	6,510	6.95
Bituminous aggregate, coarse	173	1,080	6.22
Bituminous surface-treatment aggregate	514	3,780	7.34
Other graded coarse aggregates	6,150	37,900	6.16
Total or average	7,780	49,300	6.33
Fine aggregate (-¾ inch):			
Stone sand, concrete	W	W	4.28
Stone sand, bituminous mix or seal	W	W	4.89
Screening, undesignated	1,670	6,830	4.08
Other fine aggregates	697	3,300	4.73
Total or average	2,370	10,100	4.28
Coarse and fine aggregates:			
Graded road base or subbase	956	5,140	5.38
Crusher run or fill or waste	4,630	20,900	4.52
Other coarse and fine aggregtates	356	1,570	4.41
Total or average	5,940	27,600	4.65
Other construction materials[2]	(3)	(3)	41.94
Agricultural:			
Agricultural limestone	29	121	4.17
Poultry grit and mineral food	(3)	(3)	8.16
Chemical and metallurgical:			
Cement manufacture	(4)	(4)	3.12
Lime manufacture	(4)	(4)	4.75
Total or average	1,270	4,510	3.54
Special, other fillers or extenders	(3)	(3)	8.16
Other miscellaneous uses and specified uses not listed	40	197	4.93
Unspecified:[5]			
Reported	17,300	76,400	4.41
Estimated	4,300	17,000	3.99
Total or average	21,600	93,500	4.32
Grand total or average	40,100	193,000	4.80

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes building products.
[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[4]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 3b

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	281	$1,920	$6.84
Filter stone	55	322	5.85
Other coarse aggregates	329	1,510	4.59
Total or average	665	3,750	5.65
Coarse aggregate, graded:			
Concrete aggregate, coarse	451	3,380	7.50
Bituminous aggregate, coarse	W	W	7.40
Bituminous surface-treatment aggregate	W	W	8.11
Railroad ballast	W	W	6.61
Other graded coarse aggregates	10,400	58,300	5.62
Total or average	11,900	69,700	5.84
Fine aggregate (-¾ inch):			
Stone sand, concrete	W	W	4.25
Stone sand, bituminous mix or seal	W	W	9.38
Screening, undesignated	1,560	6,850	4.39
Other fine aggregates	247	1,190	4.83
Total or average	2,020	8,970	4.44
Coarse and fine aggregates:			
Graded road base or subbase	149	1,140	7.66
Unpaved road surfacing	(2)	(2)	4.40
Crusher run or fill or waste	5,020	23,400	4.65
Other coarse and fine aggregtates	498	2,190	4.41
Total or average	5,670	26,700	4.71
Other construction materials	1	11	11.00
Agricultural:			
Agricultural limestone	W	W	4.04
Poultry grit and mineral food	W	W	8.82
Total or average	83	605	7.29
Chemical and metallurgical:			
Cement manufacture	2,890	9,860	3.42
Lime manufacture	(3)	(3)	4.68
Special, other fillers or extenders	(3)	(3)	8.82
Other miscellaneous uses and specified uses not listed	(3)	(3)	5.02
Unspecified:[4]			
Reported	12,300	57,300	4.65
Estimated	4,200	15,000	3.68
Total or average	16,500	72,700	4.40
Grand total or average	40,200	195,000	4.84

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	W	W
Coarse aggregate, graded[4]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W	W	W
Coarse and fine aggregate[6]	W	W	W	W	W	W
Other construction materials[7]	--	--	--	--	--	--
Agricultural[8]	W	W	W	W	--	--
Chemical and metallurgical[9]	--	--	W	W	W	W
Special[10]	--	--	W	W	--	--
Other miscellaneous uses and specified uses not listed	--	--	40	197	--	--
Unspecified:[11]						
Reported	3,220	15,800	2,290	9,170	8,460	36,700
Estimated	1,200	4,700	590	2,200	--	--
Total	8,520	45,000	4,380	19,000	19,000	90,800

	District 5	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregate[6]	W	W
Other construction materials[7]	W	W
Agricultural[8]	--	--
Chemical and metallurgical[9]	--	--
Special[10]	--	--
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[11]	3,370	14,700
Estimated	2,500	10,000
Total	8,260	37,900

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]No crushed stone was produced in District 1.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6]Includes crusher run (select material or fill), graded road base or subbase, and other coarse and fine aggregates.

[7]Includes building products.

[8]Includes agricultural limestone and poultry grit and mineral food.

[9] Includes cement and lime manufacture.

[10]Includes other fillers or extenders.

[11]Reported and estimated production without a breakdown by end use.

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TABLE 4b

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	W	W
Coarse aggregate, graded[4]	W	W	W	W	9,950	56,600
Fine aggregate (-⅜ inch)[5]	W	W	W	W	W	W
Coarse and fine aggregate[6]	W	W	W	W	W	W
Other construction materials	--	--	1	11	--	--
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	W	W	W	W	W	W
Special[9]	--	--	W	W	--	--
Other miscellaneous uses and specified uses not listed	--	--	--	--	W	W
Unspecified:[10]						
Reported	4,740	24,300	944	4,160	3,790	16,300
Estimated	300	1,300	600	2,300	1,100	3,800
Total	7,990	40,800	4,300	19,600	19,900	98,500

Use	District 5	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	1,200	7,140
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregate[6]	W	W
Other construction materials	--	--
Agricultural[7]	--	--
Chemical and metallurgical[8]	--	--
Special[9]	--	--
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[10]		
Reported	2,840	12,500
Estimated	2,200	8,000
Total	7,990	35,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]No crushed stone was produced in District 1.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes cement and lime manufacture.

[9]Includes other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,500	$18,100	$5.17
Plaster and gunite sands	66	388	5.88
Concrete products (blocks, bricks, pipe, decorative, etc.)	90	481	5.34
Asphaltic concrete aggregates and other bituminous mixtures	548	2,380	4.35
Road base and coverings[2]	832	2,720	3.27
Road and other stabilization (lime)	19	66	3.47
Fill	871	2,060	2.36
Other miscellaneous uses[3]	1	16	16.00
Unspecified:[4]			
Reported	1,400	6,600	4.71
Estimated	3,700	16,000	4.24
Total or average	11,000	48,500	4.42

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,170	$13,200	$6.09
Plaster and gunite sands	60	354	5.88
Concrete products (blocks, bricks, pipe, decorative, etc.)	18	126	6.88
Asphaltic concrete aggregates and other bituminous mixtures	527	2,580	4.89
Road base and coverings	809	2,870	3.54
Fill	1,100	2,130	1.94
Other miscellaneous uses[2]	3	17	6.62
Unspecified:[3]			
Reported	3,590	15,600	4.34
Estimated	3,700	17,000	4.58
Total or average	12,000	53,700	4.49

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes snow and ice control.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2 and 3		District 4 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	W	W	1,870	9,310	W	W
Asphaltic concrete aggregates and road base materials[4]	W	W	509	2,290	W	W
Fill	221	437	299	1,030	351	596
Other miscellaneous uses[5]	1,000	5,380	--	--	1,670	7,150
Unspecified:[6]						
Reported	21	209	467	1,660	914	4,730
Estimated	300	1,400	1,600	6,500	1,700	7,800
Total	1,570	7,420	4,780	20,800	4,640	20,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 and districts 4 and 5 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (cement and lime).
[5]Includes snow and ice control.
[6]Reported and estimated production without a breakdown by end use.

TABLE 6b
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 4		Districts 3 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	750	4,520	1,300	8,200	191	955
Asphaltic concrete aggregates and road base materials	298	850	W	W	W	W
Fill	175	258	857	1,790	65	82
Other miscellaneous uses[4]	3	16	631	2,350	407	2,240
Unspecified:[5]						
Reported	13	129	3,500	15,100	81	369
Estimated	230	990	2,500	12,000	920	4,100
Total	1,460	6,760	8,840	39,200	1,660	7,790

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 4 and districts 3 and 5 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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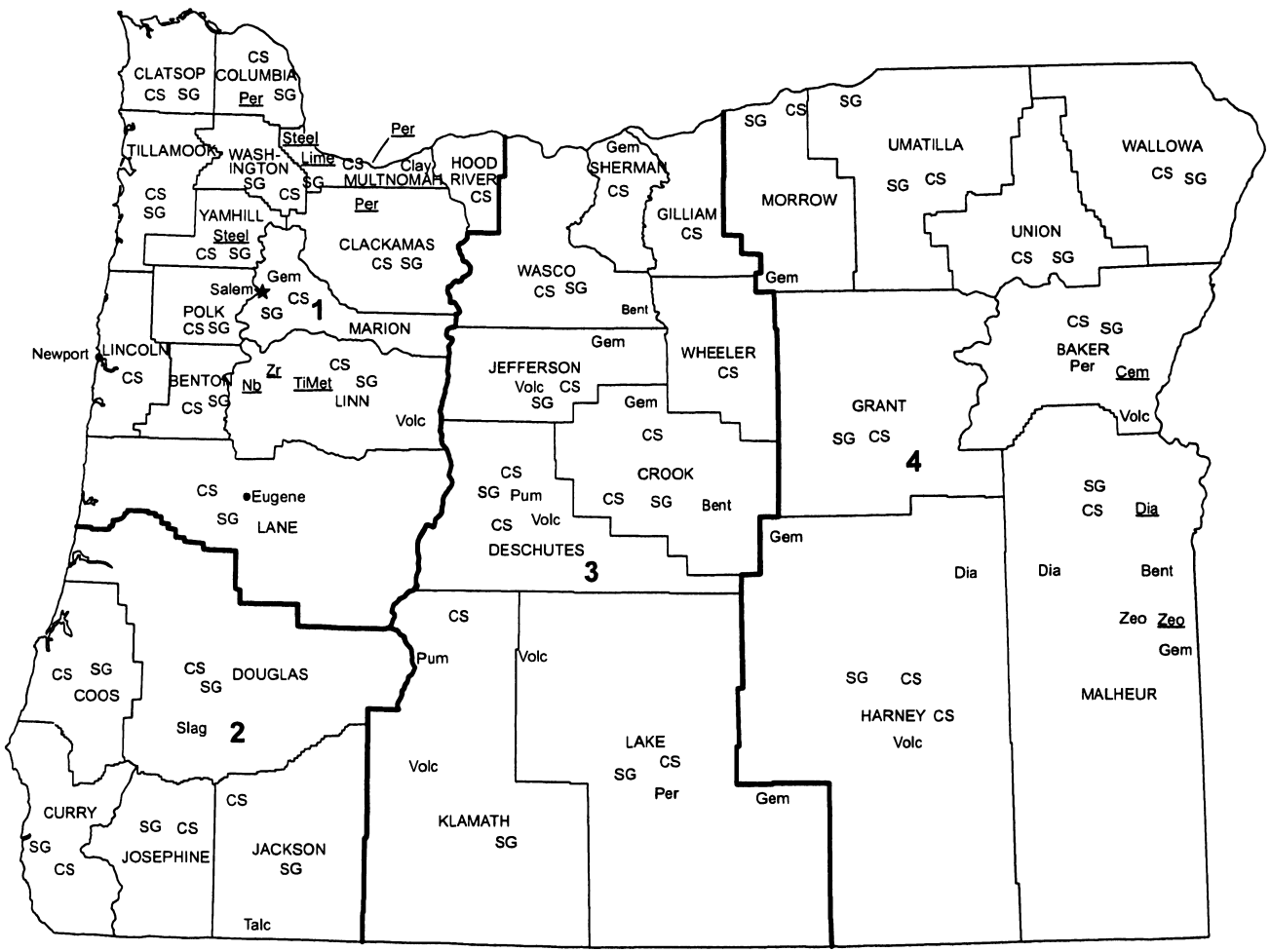
OREGON



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Dia	Diatomite
Dia	Diatomite plant
Gem	Gemstone
Lime	Lime plant
Nb	Columbium (niobium) plant
Per	Perlite
Per	Perlite plant
Pum	Pumice and pumicite
SG	Construction sand and gravel
Slag	Slag
Steel	Steel plant
Talc	Talc minerals
TiMet	Titanium metal plant
Volc	Volcanic cinder
Zeo	Zeolites
Zeo	Zeolite plant
Zr	Zirconium plant

0 50 Kilometers

Source: Oregon Department of Geology and Mineral Industries/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF OREGON

In 2004, Oregon's nonfuel raw mineral production was valued[1] at $367 million, based upon annual U.S. Geological Survey (USGS) data. This was a 14.7% increase from the State's total nonfuel mineral value for 2003,[2] which was unchanged from 2002. The State remained 35th in rank among the 50 States in total nonfuel mineral production value and accounted for nearly 1% of the U.S. total value.

Industrial minerals accounted for all of Oregon's nonfuel raw mineral and material production. In 2004, construction sand and gravel and crushed stone, by value, remained the State's two leading nonfuel mineral commodities, followed by portland cement, diatomite, and lime (descending order of value). The former two accounted for more than 68% of Oregon's total nonfuel mineral value, while all five account for about 97% of the State's total raw nonfuel mineral economy. Increases in the values of construction sand and gravel (up $15 million), crushed stone (up $9 million), diatomite, and portland cement led the State's rise in value from that of 2003. No commodities showed significant decreases in value. In 2004, Oregon continued to be second in the quantity of crude perlite produced and third in regards to diatomite and gemstones (gemstones based upon value). The State rose in rank to first from second in the production of pumice and pumicite and remained a significant producer of crushed stone and construction sand and gravel (descending order of value).

In 2003, a rise in the value of crushed stone of $16 million was balanced out by decreases in the values of portland cement, construction sand and gravel (down $6 million), and pumice and pumicite, resulting in no net change for the year.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.
All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OREGON[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Clays:						
Bentonite	W	W	W	W	10	W
Common	237	662	W	W	W	W
Gemstones	NA	1,340	NA	1,200	NA	1,210
Sand and gravel, construction	19,500	116,000	18,500	110,000	21,000	125,000
Stone, crushed	19,800	101,000	21,800	117,000	22,800	126,000
Zeolites metric tons	W	NA	W	NA	--	--
Combine value of cement (portland), diatomite, emery, (2002), lime, perlite (crude), pumice and pumicite, talc (crude), and values indicated by symbol W	XX	101,000	XX	92,700	XX	114,000
Total	XX	320,000	XX	320,000	XX	367,000

NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
OREGON: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	1	W	W	$5.51	2	W	W	$5.53	2	W	W	$5.52
Granite	6	W	W	4.14	2	W	W	5.67	1	W	W	6.07
Traprock	153 r	16,900 r	$86,600 r	5.11 r	187	18,700	$100,000	5.37	141	19,100	$107,000	5.59
Volcanic cinder and scoria	1	W	W	4.54	2	W	W	4.96	2	W	W	4.96
Miscellaneous stone	22 r	1,600 r	7,630 r	4.77 r	10	1,770	8,860	5.01	11	2,420	11,900	4.92
Total or average	XX	19,800	101,000	5.10	XX	21,800	117,000	5.35	XX	22,800	126,000	5.52

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.51
Riprap and jetty stone	148	$1,030	6.93
Filter stone	148	1,030	6.97
Other coarse aggregates	995	6,690	6.72
Total or average	1,290	8,750	6.78
Coarse aggregate, graded:			
Concrete aggregate, coarse	143	1,040	7.31
Bituminous aggregate, coarse	300	2,160	7.19
Bituminous surface-treatment aggregate	(2)	(2)	5.51
Railroad ballast	179	1,140	6.38
Other graded coarse aggregates	284	2,000	7.02
Total or average	906	6,330	6.99
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	11.18
Stone sand, bituminous mix or seal	234	1,860	7.96
Screening, undesignated	(3)	(3)	5.21
Other fine aggregates	260	2,440	9.37
Total or average	494	4,300	8.70
Coarse and fine aggregates:			
Graded road base or subbase	4,900	25,800	5.26
Unpaved road surfacing	874	4,750	5.44
Terrazzo and exposed aggregate	(4)	(4)	5.52
Crusher run or fill or waste	523	2,780	5.32
Other coarse and fine aggregates	1,520	7,430	4.88
Total or average	7,920	40,600	5.13
Other construction materials[5]	261	2,840	10.86
Chemical and metallurgical, cement manufacture	(6)	(6)	5.51
Special, asphalt fillers or extenders	(6)	(6)	5.11
Other miscellaneous uses:			
Sugar refining	(6)	(6)	5.51
Other specified uses not listed	60	333	5.51
Unspecified:[7]			
Reported	6,640	32,600	4.90
Estimated	3,300	15,000	4.59
Total or average	9,940	47,700	4.80
Grand total or average	21,800	117,000	5.35

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Includes drain fields.

[6]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[7]Reported and estimated production without a breakdown by end use.

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TABLE 3b

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.17
Riprap and jetty stone	142	$1,000	7.06
Filter stone	94	591	6.29
Other coarse aggregates	738	4,410	5.98
Total or average	974	6,010	6.17
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	8.23
Bituminous aggregate, coarse	610	4,140	6.78
Bituminous surface-treatment aggregate	92	644	7.00
Railroad ballast	160	1,040	6.49
Other graded coarse aggregates	210	1,680	7.99
Total or average	1,070	7,500	6.99
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	8.82
Stone sand, bituminous mix or seal	78	528	6.77
Screening, undesignated	14	74	5.29
Other fine aggregates	183	1,610	8.81
Total or average	275	2,220	8.05
Coarse and fine aggregates:			
Graded road base or subbase	3,490	22,000	6.32
Unpaved road surfacing	371	1,850	4.99
Terrazzo and exposed aggregate	(4)	(4)	9.59
Crusher run or fill or waste	280	1,460	5.22
Other coarse and fine aggregates	1,780	10,500	5.89
Total or average	5,920	35,800	6.06
Other construction materials	63	77	1.22
Chemical and metallurgical, cement manufacture	(5)	(5)	5.51
Other miscellaneous uses, sugar refining	(5)	(5)	5.51
Unspecified:[6]			
Reported	7,950	40,500	5.10
Estimated	5,200	26,000	5.03
Total or average	13,100	66,500	5.07
Grand total or average	22,800	126,000	5.52

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary; included with "Other coarse aggregates."

[3]Withheld to avoid disclosing company proprietary; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary; included with "Other coarse and fine aggregates."

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 4a

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	267	1,910	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregates[5]	3,040	18,900	2,300	12,200	552	3,110
Other construction materials[6]	173	2,100	18	127	71	608
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses[9]	--	--	W	W	--	--
Unspecified:[10]						
Reported	4,930	24,200	150	822	53	285
Estimated	2,800	13,000	200	920	200	1,100
Total	11,700	63,400	3,650	20,500	1,550	10,800

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	--	--
Coarse aggregate, graded[3]	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregates[5]	524	2,470	1,400	4,060
Other construction materials[6]	--	--	--	--
Chemical and metallurgical[7]	W	W	--	--
Special[8]	W	W	--	--
Other miscellaneous uses[9]	W	W	--	--
Unspecified:[10]				
Reported	8	44	1,510	7,250
Estimated	120	560	--	--
Total	1,970	10,600	2,910	11,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes drain fields.

[7]Includes cement manufacture.

[8]Includes asphalt fillers or extenders.

[9]Includes sugar refining and other specified uses not listed.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	182	1,170
Coarse aggregate, graded[3]	W	W	W	W	622	4,710
Fine aggregate (-⅜ inch)[4]	63	637	--	--	142	1,110
Coarse and fine aggregates[5]	2,740	17,500	1,350	7,230	1,210	7,880
Other construction materials	64	77	--	--	--	--
Chemical and metallurgical[6]	--	--	--	--	--	--
Other miscellaneous uses[7]	--	--	--	--	--	--
Unspecified:[8]						
Reported	5,240	27,800	481	2,350	21	111
Estimated	3,700	18,000	1,200	7,000	70	380
Total	12,200	66,300	3,610	20,100	2,250	15,400

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	--	--
Coarse aggregate, graded[3]	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregates[5]	625	3,230	--	--
Other construction materials	--	--	--	--
Chemical and metallurgical[6]	W	W	--	--
Other miscellaneous uses[7]	W	W	--	--
Unspecified:[8]				
Reported	8	45	2,200	10,200
Estimated	120	560	--	--
Total	2,500	13,700	2,200	10,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes cement manufacture.

[7]Includes sugar refining.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,430	$22,900	$6.66
Plaster and gunite sands	13	165	12.69
Concrete products (blocks, bricks, pipe, decorative, etc.)	15	184	12.27
Asphaltic concrete aggregates and other bituminous mixtures	1,580	10,700	6.78
Road base and coverings[2]	3,250	20,300	6.25
Road and other stabilization (cement)	50	216	4.32
Fill	313	1,500	4.79
Snow and ice control	8	43	5.38
Other miscellaneous uses[3]	399	2,640	6.62
Unspecified:[4]			
Reported	4,840	26,600	5.50
Estimated	4,600	25,000	5.33
Total or average	18,500	110,000	5.92

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (lime).
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,600	$25,500	$7.10
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	29	303	10.41
Asphaltic concrete aggregates and other bituminous mixtures	1,600	10,500	6.54
Road base and coverings	4,520	27,000	5.98
Fill	393	1,680	4.29
Other miscellaneous uses[3]	378	2,850	7.54
Unspecified:[4]			
Reported	6,410	37,600	5.87
Estimated	4,100	20,000	4.91
Total or average	21,000	125,000	5.97

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	2,300	13,800	815	6,390	W	W
Asphaltic concrete aggregates and other bituminous mixtures[3]	992	6,290	W	W	23	143
Road base and coverings[2]	2,590	16,100	W	W	W	W
Road and other stabilization (cement)	--	--	--	--	--	--
Fill	178	736	65	351	60	389
Other miscellaneous uses[4]	368	2,200	882	6,570	315	2,790
Unspecified:[5]						
Reported	4,110	24,200	111	695	350	603
Estimated	1,200	6,900	100	700	2,900	15,000
Total	11,800	70,300	1,980	14,700	3,660	18,700

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--
Road base and coverings[2]	215	1,240	--	--
Road and other stabilization (cement)	50	216	--	--
Fill	10	25	--	--
Other miscellaneous uses[4]	196	1,400	--	--
Unspecified:[5]				
Reported	220	1,000	53	105
Estimated	400	2,100	--	--
Total	1,070	6,020	53	105

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Includes railroad ballast, and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	2,210	13,400	865	6,750	438	4,790
Asphaltic concrete aggregates and other bituminous mixtures	971	5,840	394	3,330	W	W
Road base and coverings	3,540	21,400	W	W	W	W
Fill	233	992	64	384	78	261
Other miscellaneous uses[3]	354	2,130	480	3,220	448	2,220
Unspecified:[4]						
Reported	5,400	32,000	377	2,340	239	1,410
Estimated	1,500	8,800	60	370	2,100	8,900
Total	14,200	84,500	2,240	16,400	3,320	17,600

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	113	829	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--
Road base and coverings	216	1,210	--	--
Fill	18	47	--	--
Other miscellaneous uses[3]	89	987	--	--
Unspecified:[4]				
Reported	266	1,310	134	607
Estimated	370	1,900	10	30
Total	1,070	6,290	141	635

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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PENNSYLVANIA

LEGEND

- County boundary
- ★ Capital
- • City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-Sd	Dimension sandstone
D-Sl	Dimension slate
FePig	Iron oxide pigments
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Mica	Mica
Nb	Columbium (niobium) plant
Nb/Ta	Columbium (niobium) and tantalum plant
Peat	Peat
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
TiMet	Titanium metal plant
Vm	Vermiculite
Zn	Zinc plant
⬭	Concentration of mineral operations

0 50 Kilometers

Source: Pennsylvania Bureau of Topographic and Geologic Survey/U.S. Geological Survey (2004)

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The Mineral Industry of Pennsylvania

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Pennsylvania Bureau of Topographic and Geologic Survey for collecting information on all nonfuel minerals.

In 2004, Pennsylvania's nonfuel raw mineral production was valued[1] at $1.4 billion, based upon annual U.S. Geological Survey (USGS) data. This was a more than 10%, or $130 million, increase from the $1.27 billion total value for 2003[2], which was down 1.6% from 2002. Pennsylvania remained 11th in rank in the Nation in total nonfuel mineral production value and accounted for more than 3% of the U.S. total value. [The actual totals for 2002-03 are higher than those shown in table 1; industrial sand and gravel and tripoli data have been withheld (company proprietary data).]

In 2004, Pennsylvania continued to be among the Nation's leading States in the production of crushed stone, portland cement, and construction sand and gravel (descending order of value). These mineral commodities accounted for more than 88% of the Pennsylvania's total nonfuel raw mineral production value. Lime accounted for 7% of the value (table 1) followed by masonry cement and industrial sand and gravel. In 2004, led especially by portland cement and crushed stone, nearly all the State's mineral commodities increased in value. With production increases of nearly 9% in portland cement and 7.7% in crushed stone, the commodities' values rose $52 million and $38 million, respectively (table 1). Other mineral commodities with significant increases in value were construction sand and gravel, up $12 million, lime, up about $10 million, and masonry cement (company proprietary data). Only the value of dimension stone was down, slightly.

In 2003, the largest changes in value were in crushed stone and cement (portland and masonry). Crushed stone's value rose by $19 million and cement's value decreased by $37 million, resulting in the State's net decrease in value for the year. Other changes in value of $1 million or more included lime, up $2.5 million, and dimension stone, down $1.5 million (table 1).

In 2004, Pennsylvania continued to be ranked second in the Nation in the quantity of crushed stone produced, third in portland cement, fourth of 4 States that produce tripoli, and sixth in lime and masonry cement. The State rose to fifth from eighth in the production of peat, and substantial quantities of construction sand and gravel, industrial sand and gravel, dimension stone, and common clays were produced in the State.

Pennsylvania is exclusively an industrial mineral- and coal-producing State; metals that were produced in the State were processed from materials acquired from foreign and other domestic sources. The State rose to third from fifth in the Nation in the production of raw steel in 2004, with a 13% increase in raw steel output to 6.26 million metric tons (American Iron and Steel Institute, 2005, p. 76).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

Reference Cited

American Iron and Steel Institute, 2005, Pig iron and raw steel production-Final 2004, AIS-7, subsection of Annual statistical report 2004: Washington, DC, American Iron and Steel Institute, 130 p.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN PENNSYLVANIA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	341	38,000 e	342	35,900 e	W	W
Portland	6,130	456,000 e	5,720	421,000 e	6,230	473,000 e
Clays, common	779	2,560	750	2,240	822	3,270
Gemstones	NA	1	NA	1	NA	1
Lime	1,230	87,600	1,190	90,100	1,220	100,000
Peat	3	132	8	219	11	307
Sand and gravel, construction	18,100	115,000	18,400	115,000	20,000	127,000
Stone:						
Crushed	102,000	578,000 r	104,000	597,000	112,000	635,000
Dimension	37	11,900	32	10,400	33	10,100
Combined values of sand and gravel (industrial), tripoli, and value indicated by symbol W	XX	(3)	XX	(3)	XX	55,800
Total	XX	1,290,000	XX	1,270,000	XX	1,400,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value withheld to avoid disclosing company proprietary data.

TABLE 2
PENNSYLVANIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	105 r	60,800 r	$357,000 r	$5.87 r	104	61,600	$352,000	$5.71	102	65,500	$368,000	$5.61
Dolomite	15	13,000	68,400	5.25	14	14,300	79,100	5.55	14	16,000	89,800	5.60
Marble	1	W	W	8.12	1	W	W	6.24	1	W	W	6.11
Granite	7	4,450	25,300	5.68	7	4,680	26,700	5.70	7	5,120	29,300	5.73
Traprock	9	5,150	25,600	4.97	9	4,690	28,200	6.01	8	5,710	34,000	5.96
Sandstone and quartzite	43	10,800	60,500	5.58	37	11,100	65,600	5.89	35	10,600	63,000	5.92
Slate	1	W	W	4.91	1	W	W	5.51	1	W	W	5.51
Miscellaneous stone	13	6,240	34,700	5.57	12	6,860	40,100	5.84	13	8,160	46,800	5.73
Total or average	XX	102,000	578,000 r	5.69 r	XX	104,000	597,000	5.73	XX	112,000	635,000	5.67

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes "limestone-dolomite" reported with no distinction between the two.

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TABLE 3a

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	188	$1,480	$7.88
Riprap and jetty stone	1,020	6,700	6.58
Filter stone	324	2,380	7.35
Other coarse aggregates	2,090	10,100	4.83
Total or average	3,630	20,700	5.70
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,980	19,000	6.38
Bituminous aggregate, coarse	4,560	29,300	6.41
Bituminous surface-treatment aggregate	2,040	14,400	7.05
Railroad ballast	824	7,000	8.50
Other graded coarse aggregates	5,410	31,700	5.86
Total or average	15,800	101,000	6.41
Fine aggregate (-⅜ inch):			
Stone sand, concrete	545	4,560	8.37
Stone sand, bituminous mix or seal	2,230	15,800	7.07
Screening, undesignated	1,520	8,710	5.73
Other fine aggregates	1,790	12,000	6.72
Total or average	6,080	41,100	6.75
Coarse and fine aggregates:			
Graded road base or subbase	9,440	55,900	5.92
Unpaved road surfacing	425	3,160	7.44
Crusher run or fill or waste	1,490	6,250	4.20
Other coarse and fine aggregates	5,240	27,100	5.16
Total or average	16,600	92,300	5.56
Other construction materials	1,190	6,810	5.72
Agricultural, limestone	379	4,220	11.12
Chemical and metallurgical:			
Cement manufacture	6,220	23,000	3.69
Lime manufacture	1,360	9,910	7.28
Flux stone	W	W	6.55
Chemical stone	W	W	4.63
Sulfur oxide removal	401	3,200	7.97
Total or average	8,150	37,100	4.55
Special:			
Mine dusting or acid water treatment	W	W	19.84
Whiting or whiting substitute	W	W	33.92
Other fillers or extenders	528	6,690	12.67
Total or average	689	12,000	17.39
Other miscellaneous uses and specified uses not listed	662	4,520	6.83
Unspecified:[2]			
Reported	30,000	168,000	5.62
Estimated	21,000	110,000	5.14
Total or average	51,000	277,000	5.42
Grand total or average	104,000	597,000	5.73

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

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TABLE 3b

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$7.32
Riprap and jetty stone	970	$7,240	7.46
Filter stone	513	3,340	6.51
Other coarse aggregates	1,130	7,860	6.98
Total or average	2,610	18,400	7.07
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,250	14,400	6.40
Bituminous aggregate, coarse	4,550	29,500	6.47
Bituminous surface-treatment aggregate	1,740	11,500	6.58
Railroad ballast	921	7,700	8.36
Other graded coarse aggregates	3,710	22,900	6.15
Total or average	13,200	85,800	6.51
Fine aggregate (-⅜ inch):			
Stone sand, concrete	560	3,640	6.51
Stone sand, bituminous mix or seal	2,340	14,800	6.32
Screening, undesignated	836	5,200	6.22
Other fine aggregates	2,220	15,200	6.85
Total or average	5,960	38,800	6.52
Coarse and fine aggregates:			
Graded road base or subbase	4,660	24,900	5.35
Unpaved road surfacing	403	3,070	7.61
Crusher run or fill or waste	1,490	6,210	4.18
Roofing granules	(2)	(2)	3.78
Other coarse and fine aggregates	5,610	29,900	5.34
Total or average	12,100	64,100	5.28
Other construction materials	1,150	6,060	5.29
Agricultural:			
Agricultural limestone	783	8,810	11.25
Poultry grit and mineral food	(3)	(3)	5.47
Chemical and metallurgical:			
Cement manufacture	7,270	26,900	3.71
Lime manufacture	618	2,580	4.17
Flux stone	(3)	(3)	6.72
Sulfur oxide removal	279	2,180	7.83
Total or average	8,160	31,700	3.88
Special:			
Whiting or whiting substitute	(3)	(3)	15.17
Other fillers or extenders	102	1,280	12.51
Other miscellaneous uses and specified uses not listed	580	3,980	6.87
Unspecified:[4]			
Reported	38,100	215,000	5.64
Estimated	29,000	160,000	5.49
Total or average	67,100	374,000	5.58
Grand total or average	112,000	635,000	5.67

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	4,090	27,500
Fine aggregate (-⅜ inch)[4]	482	2,730	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	3,510	19,500
Other construction materials	--	--	--	--	82	514
Agricultural[6]	--	--	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	1,810	8,870
Special[8]	--	--	W	W	102	1,880
Other miscellaneous uses and specified uses not listed	--	--	--	--	507	3,160
Unspecified:[9]						
Reported	1,770	10,000	3,160	17,900	1,710	9,790
Estimated	680	3,600	2,900	14,000	6,600	37,000
Total	4,470	27,400	8,920	49,300	22,000	131,000

	District 4	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[2]	1,380	9,230
Coarse aggregate, graded[3]	10,600	67,300
Fine aggregate (-⅜ inch)[4]	3,730	24,500
Coarse and fine aggregates[5]	11,400	63,200
Other construction materials	1,110	6,290
Agricultural[6]	W	W
Chemical and metallurgical[7]	5,240	19,500
Special[8]	W	W
Other miscellaneous uses and specified uses not listed	155	1,370
Unspecified:[9]		
Reported	23,300	131,000
Estimated	11,000	54,000
Total	68,800	389,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, chemical stone, flux stone, lime manufacture, and sulfur oxide removal.

[8]Includes mine dusting or acid water treatment, whiting or whiting substitute, and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	968	6,940
Coarse aggregate, graded[3]	W	W	W	W	3,340	21,400
Fine aggregate (-⅜ inch)[4]	W	W	W	W	1,640	9,590
Coarse and fine aggregates[5]	W	W	W	W	3,480	18,500
Other construction materials	--	--	--	--	172	542
Agricultural[6]	--	--	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	W	W	--	--
Other miscellaneous uses and specified uses not listed	--	--	--	--	580	3,980
Unspecified:[9]						
Reported	2,140	12,100	4,230	24,000	1,360	9,390
Estimated	2,400	13,000	2,500	12,000	7,900	44,000
Total	4,950	27,500	9,760	54,300	21,300	127,000

Use	District 4	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[2]	1,360	9,950
Coarse aggregate, graded[3]	8,560	56,300
Fine aggregate (-⅜ inch)[4]	3,680	25,300
Coarse and fine aggregates[5]	7,480	39,500
Other construction materials	973	5,520
Agricultural[6]	W	W
Chemical and metallurgical[7]	W	W
Special[8]	W	W
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[9]		
Reported	30,400	170,000
Estimated	16,000	91,000
Total	76,100	426,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone and poultry grit and mineral food.

[7]Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

[8]Includes whiting or whiting substitute and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,440	$24,600	$7.14
Plaster and gunite sands	32	245	7.66
Concrete products (blocks, bricks, pipe, decorative, etc.)	277	1,790	6.47
Asphaltic concrete aggregates and other bituminous mixtures	1,040	5,750	5.55
Road base and coverings	1,030	5,390	5.23
Fill	2,520	12,400	4.93
Snow and ice control	213	1,030	4.82
Railroad ballast	25	143	5.72
Other miscellaneous uses	748	5,560	7.44
Unspecified:[2]			
Reported	6,360	41,700	6.56
Estimated	2,700	17,000	6.11
Total or average	18,400	115,000	6.25

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 5b
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	2,030	$15,900	$7.85
Asphaltic concrete aggregates and other bituminous mixtures	1,110	8,330	7.53
Road base and coverings	1,140	6,880	6.01
Fill	2,900	14,500	5.02
Snow and ice control	421	1,650	3.91
Other miscellaneous uses[3]	311	2,790	8.98
Unspecified:[4]			
Reported	5,070	33,000	6.52
Estimated	7,100	43,000	6.14
Total or average	20,000	127,000	6.32

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	609	3,990	687	5,110	W	W
Asphaltic concrete aggregates and other bituminous mixtures	527	2,830	214	1,270	294	1,650
Road base and coverings	487	2,490	131	754	323	1,640
Fill	280	1,160	32	178	824	4,280
Snow and ice control	148	615	W	W	50	299
Other miscellaneous uses[3]	287	1,720	218	1,240	1,880	12,300
Unspecified:[4]						
Reported	673	4,520	622	4,290	3,760	25,200
Estimated	900	5,200	1,100	6,400	400	2,500
Total	3,920	22,500	2,970	19,200	7,560	47,800

	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--	--	--
Road base and coverings	86	486	--	--
Fill	1,380	6,780	--	--
Snow and ice control	W	W	--	--
Other miscellaneous uses[3]	851	8,080	--	--
Unspecified:[4]				
Reported	1,140	7,420	160	264
Estimated	300	2,400	--	--
Total	3,790	25,100	160	264

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6b
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	744	5,780	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	49	282	W	W
Road base and coverings	680	4,190	94	551	270	1,310
Fill	306	1,300	96	391	418	1,850
Snow and ice control	262	936	W	W	W	W
Other miscellaneous uses[3]	983	8,400	275	2,370	845	3,870
Unspecified:[4]						
Reported	540	3,300	1,160	7,540	2,510	17,100
Estimated	1,600	10,000	1,500	9,400	3,400	21,000
Total	5,140	34,200	3,180	20,600	7,410	45,000

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	586	5,610	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--	--	--
Road base and coverings	100	817	--	--
Fill	2,080	11,000	--	--
Snow and ice control	5	33	--	--
Other miscellaneous uses[3]	118	1,420	--	--
Unspecified:[4]				
Reported	856	5,070	--	--
Estimated	400	2,600	160	260
Total	4,150	26,600	160	260

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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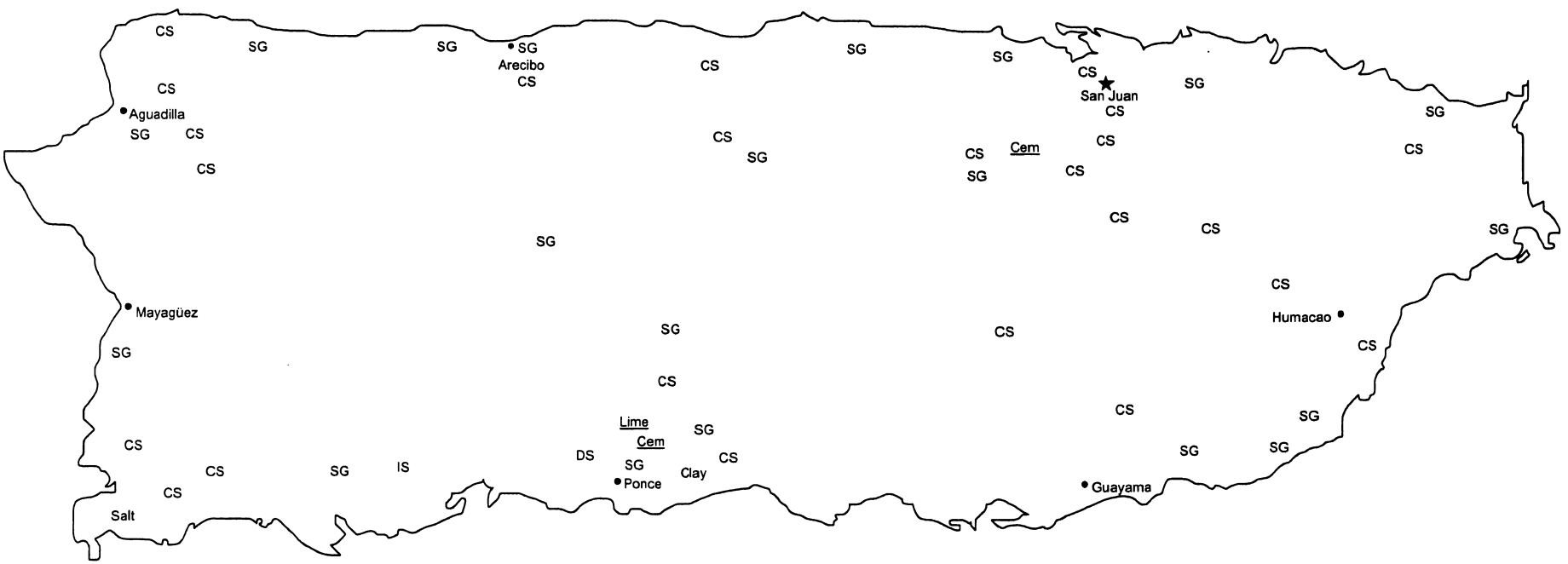
PUERTO RICO



LEGEND

- District boundary
- Capital
- City

MINERAL SYMBOLS

- Cem Cement plant
- Clay Common clay
- CS Crushed stone
- DS Dimension stone
- IS Industrial sand

(Major producing areas)

- Lime Lime plant
- Salt Salt
- SG Construction sand and gravel

0 100 Kilometers

Source: Department of Natural Resources, Commonwealth of Puerto Rico/U.S. Geological Survey (2004)

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The Mineral Industry of Puerto Rico and the Administered Islands[1]

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Puerto Rico Department of Natural Resources, Bureau of Geology, for collecting information on all nonfuel minerals.

In 2004, Puerto Rico's nonfuel raw mineral production was valued[2] at $187 million, based upon annual U.S. Geological Survey (USGS) data. If ranked in comparison with the 50 States, Puerto Rico would rank 41st in total nonfuel mineral production value.[3] Portland cement, by value, continued to be the Commonwealth's leading nonfuel mineral commodity, followed by crushed stone.

In 2004, the nonfuel mineral production value of portland cement (production up 6%) rose and accounted for the largest increase in value of Puerto Rico's nonfuel mineral commodities. The largest decrease in value was a $2.4 million decrease in crushed stone (production down about 5%). Conversely, in 2003, the largest increase in value was in crushed stone and portland cement showed the largest decrease. At nearly 48%, or $19.4 million, the rise in value of crushed stone resulted from a 15% increase in production and a higher average unit value for the commodity. The production of portland cement was down 2.6%.

In 2004, Puerto Rico produced significant quantities of portland cement; the Commonwealth would rank 17th if ranked in comparison with the 37 producing States. Construction sand and gravel was produced in Puerto Rico, mainly for use as aggregate in concrete and concrete products, as road base materials, and as fill, but production data are not available. The collection and compilation of production data for construction sand and gravel were discontinued in 1973 by the U.S. Bureau of Mines (the Federal Government Agency then responsible for collecting domestic raw nonfuel mineral production data) because of a low rate of response to surveys by the industry (Sikich and Alonso, 1993).

Metals have not been mined in Puerto Rico since the Juncos iron mine closed in 1953; prospects for resuming metal mining in the near future do not appear to be likely. However, metal occurrences are common on the island, and the possibility of developing a metal deposit will probably not be completely discounted (Sikich and Alonso, 1993).

Of the U.S. Administered Islands, only American Samoa, the Virgin Islands, and Guam recently have reported nonfuel mineral production data, and these have been limited to crushed stone. Crushed stone production and value data for Guam are shown in table 1. Data for the production of crushed stone for American Samoa (traprock) and the Virgin Islands (limestone and traprock) have been withheld (company proprietary data).

[1]While a Memorandum of Understanding (MOU) was officially made between the U.S. Geological Survey (USGS) and the Commonwealth of Puerto Rico, MOUs were not established with the Commonwealth of the Northern Mariana Islands, U.S. Caribbean and Pacific Island Possessions, or the U.S. Trust Territory of the Pacific Islands. Nevertheless, data on nonfuel raw mineral production were reported from several of the Administered Islands to the USGS. Only aggregated crushed stone data for the island of Guam of the Pacific Island Possessions are nonproprietary; these data appear in table 1.

[2]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[3]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

Reference Cited

Sikich, S.W., and Alonso, R.M., 1993, The mineral industries of Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory: U.S. Bureau of Mines Minerals Yearbook 1992, v. II, p. 467-470.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement, portland	1,530	W	1,490	W	1,580	W
Clays, common	114 r	585	114	585	114	585
Lime	W	W	W	W	11	2,250
Salt	45	1,500	45	1,500	45	1,500
Stone, crushed	7,940	40,600	9,130	60,000	8,660	57,600
Combined values of sand and gravel (industrial), stone (dimension marble), and values indicated by symbol W	XX	144,000	XX	119,000	XX	125,000
Total	XX	187,000	XX	181,000	XX	187,000
Administered Islands:						
American Samoa, stone, crushed, traprock	W	(3)	W	(3)	W	(3)
Guam, stone, crushed	846	8,370	728	7,670	1,410	13,000
Virgin Islands, stone, crushed limestone and traprock	W	(3)	W	(3)	W	(3)
Total	XX	8,370	XX	7,670	XX	13,000

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Withheld to avoid disclosing company proprietary data.

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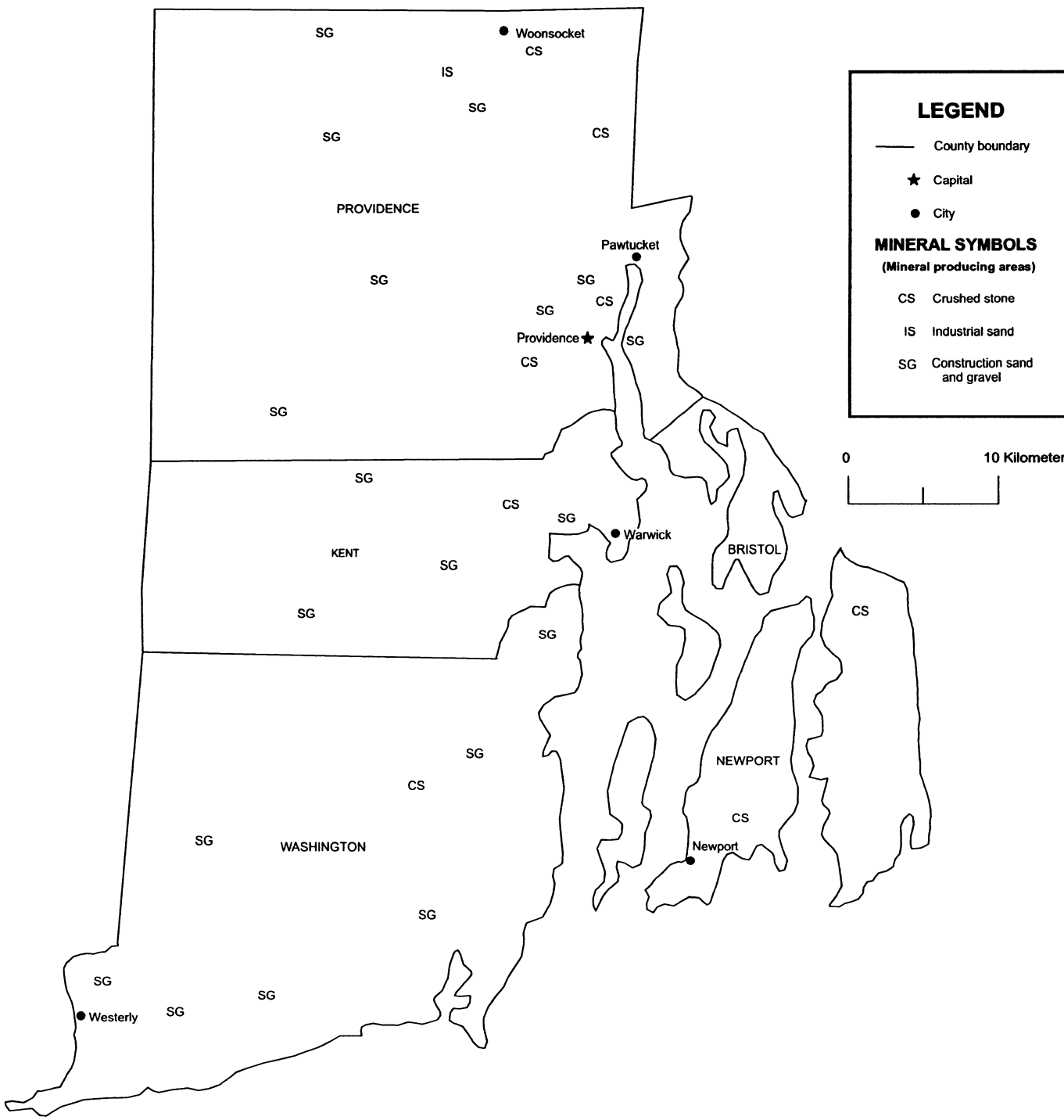
RHODE ISLAND



Source: Rhode Island Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF RHODE ISLAND

In 2004, Rhode Island's nonfuel raw mineral production was valued[1] at $34.4 million, based upon annual U.S. Geological Survey data. This was an increase of 8.5% from the State's total nonfuel mineral value for 2003,[2] which was up about 24% from 2002. (The data for industrial sand and gravel are withheld in table 1 to avoid disclosing company proprietary data; the actual total values for 2002-04 are higher than those reported in that table.)

Most of Rhode Island's nonfuel mineral production resulted from the mining and production of two basic construction materials—construction sand and gravel and crushed stone. In 2004, these two mineral commodities accounted for about 64% and 36%, respectively, of that portion of the States's nonfuel mineral economy that may be publicly disclosed. Each of the leading mineral commodities increased in value in 2004; crushed stone rose by $1.7 million and construction sand and gravel increased by $1 million. With a relatively small increase in production, industrial sand and gravel value also rose, by more than $2 million. Gemstones continued to be mined in the State by hobbyists.

In 2003, construction sand and gravel led Rhode Island's increase in total nonfuel mineral value; production increased nearly 49%, resulting in an increase of $7 million in the commodity's value from that of 2003 (table 1). This was offset slightly by a relatively small decrease in the value of crushed stone; industrial sand and gravel also had a small decrease in value for the year.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN RHODE ISLAND[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	1,760	14,100	2,450	21,000	2,490	22,000
Industrial	157	(3)	W	(3)	W	(3)
Stone, crushed	1,780	11,400	1,340	10,700	1,600	12,400
Total	XX	25,500	XX	31,700	XX	34,400

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value withheld to avoid disclosing company proprietary data.

TABLE 2
RHODE ISLAND: CRUSHED STONE SOLD OR USED. BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1	W	W	$3.97	1	W	W	$6.65	1	W	W	$6.65
Granite	5	W	W	6.70	4	W	W	8.05	3	W	W	8.60
Traprock	2	W	W	5.51	2	W	W	5.51	3	W	W	7.34
Total or average	XX	1,780	$11,400	6.41	XX	1,340	$10,700	8.00	XX	1,600	$12,400	7.74

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3a
RHODE ISLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$10.35
Riprap and jetty stone	W	W	15.43
Filter stone	W	W	10.59
Coarse aggregate, graded:			
Concrete aggregate (coarse)	W	W	10.75
Bituminous aggregate (coarse)	W	W	7.63
Bituminous surface-treatment aggregate	W	W	6.61
Fine aggregate (-⅜ inch), stone sand (concrete)	W	W	4.39
Coarse and fine aggregates:			
Graded road base or subbase	W	W	9.18
Unpaved road surfacing	W	W	11.02
Crusher run or fill or waste	W	W	9.95
Other construction materials	372	$3,560	9.56
Other miscellaneous uses and other specified uses not listed	1	3	3.00
Unspecified, estimated[2]	260	1,500	5.66
Total or average	1,340	10,700	8.00

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Estimated production without a breakdown by end use.

TABLE 3b
RHODE ISLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$13.71
Other coarse aggregate	43	$451	10.49
Coarse aggregate, graded:			
Bituminous aggregate (coarse)	W	W	9.30
Bituminous surface-treatment aggregate	W	W	9.52
Fine aggregate (-⅜ inch), bituminous aggregate (coarse)	W	W	5.19
Coarse and fine aggregates:			
Graded road base or subbase	W	W	7.28
Crusher run or fill or waste	W	W	8.76
Agricultural limestone	W	W	6.63
Other miscellaneous uses and other specified uses not listed	1	3	3.00
Unspecified, estimated[2]	840	6,200	7.37
Total or average	1,600	12,400	7.74

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Estimated production without a breakdown by end use.

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TABLE 4a
RHODE ISLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	838	$7,250	$8.65
Asphaltic concrete aggregates and road base materials	495	3,860	7.80
Fill	83	528	6.36
Snow and ice control	111	2,420	21.83
Other miscellaneous uses	32	229	7.16
Unspecified, estimated[3]	900	6,700	7.47
Total or average	2,450	21,000	8.55

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Estimated production without a breakdown by end use.

TABLE 4b
RHODE ISLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	715	$6,230	$8.71
Asphaltic concrete aggregates and road base materials	235	1,970	8.35
Fill	84	570	6.81
Snow and ice control	93	1,500	16.06
Unspecified, estimated[2]	1,400	12,000	8.63
Total or average	2,490	22,000	8.85

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Estimated production without a breakdown by end use.

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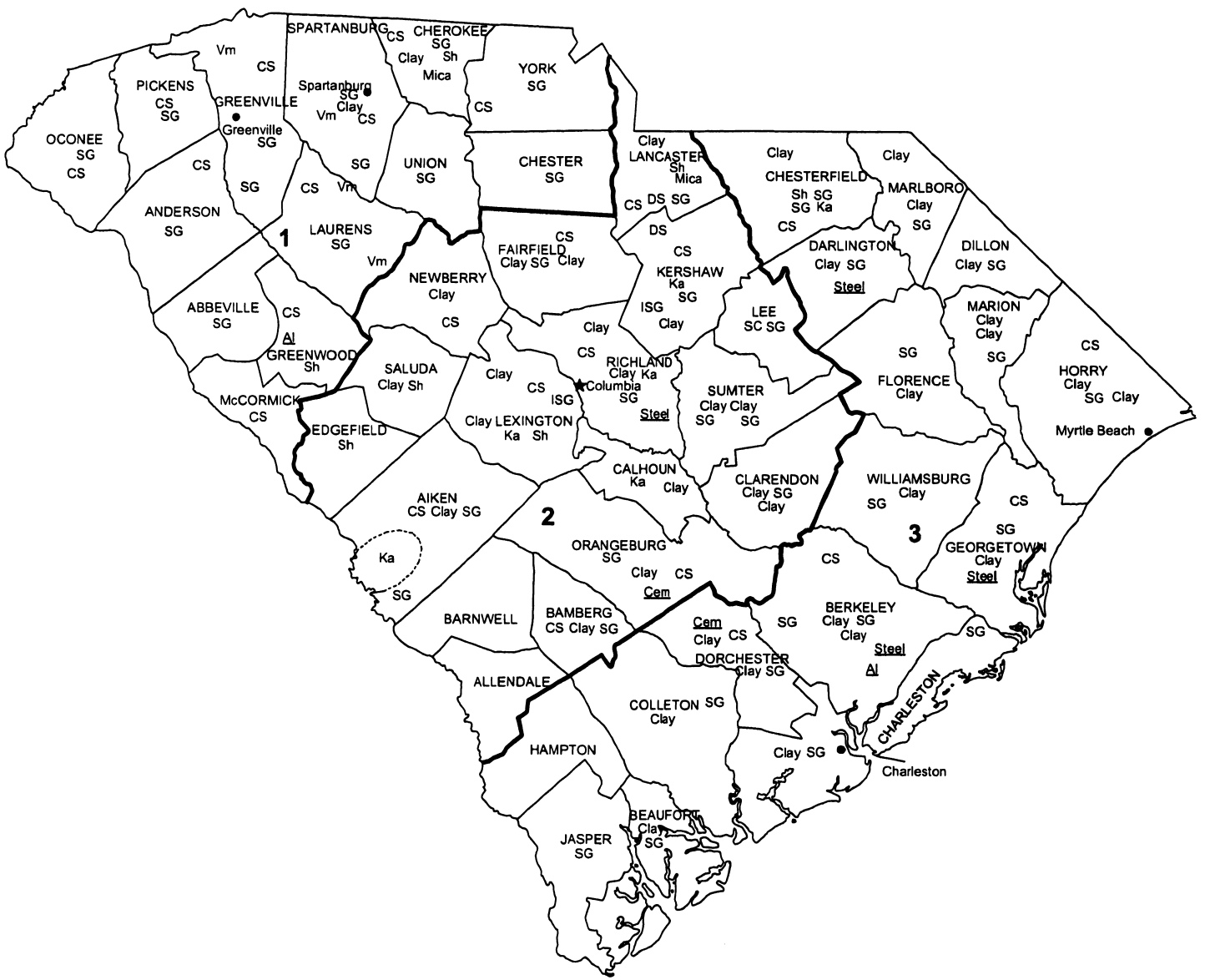
SOUTH CAROLINA



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
DS	Dimension stone
ISG	Industrial sand and gravel
Ka	Kaolin
Mica	Mica
SG	Construction sand and gravel
Sh	Shale
Steel	Steel plant
Vm	Vermiculite
	Concentration of mineral operations

0 — 40 Kilometers

Source: South Carolina Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF SOUTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2004, South Carolina's nonfuel raw mineral production was valued at $532 million, based upon annual U.S. Geological Survey (USGS) data. This was a 4.7% increase from the State's total nonfuel mineral value for 2003,[1] which was up 10.4% from 2002. The State was 27th in rank (26th in 2003) among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total. [Because data for mica and vermiculite have been withheld (company proprietary data) for 2002 and 2004, the actual total values for those years are somewhat higher than those reported in table 1.]

In 2004, cement (portland and masonry), by value, remained the State's leading nonfuel mineral commodity, followed by crushed stone, construction sand and gravel, kaolin, industrial sand and gravel, and vermiculite. The first three raw construction materials accounted for more than 92% of South Carolina's total nonfuel raw mineral production value. A 15% increase in the production of crushed stone, value up $26 million, and a more than $8 million rise in the value of cement (production down marginally overall) led the State's increase in total nonfuel mineral value for the year. The largest decrease in value was a $2.1 million drop in the value of kaolin. All other changes in value were significantly smaller and inconsequential to the net result (table 1).

In 2003, a 22% increase in the production of portland cement, cement (portland and masonry combined) value up $20.7 million, and a 6% increase in crushed stone, value up $19 million, led the State's increase in total nonfuel mineral value for the year. The largest decrease in value was in that of crude vermiculite.

In 2004, South Carolina continued to be ranked first of the two vermiculite-producing States, third in the quantity of kaolin produced, and eighth in portland cement. While the State rose to third from fourth in the production of masonry cement, it decreased to third from second in fire clays, to fifth from fourth in mica, and to ninth from eighth in common clays. In addition, significant quantities of crushed stone and industrial sand and gravel were produced in the State. Primary aluminum and raw steel also were produced in the State but from raw materials that were acquired from other domestic and foreign sources. South Carolina rose to fifth from seventh of 12 States in the production of primary aluminum in 2004.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH CAROLINA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	426	41,000 e	425	43,700 e	453	49,900 e
Portland	2,510	176,000 e	3,150	194,000 e	3,110	196,000 e
Clays:						
Common	1,020	3,360	1,060	2,660	1,050	3,350
Fire	53	739	W	W	1	64
Kaolin	374	21,400	355	21,700	296	19,600
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	10,300	35,500	10,100	34,700	9,960	35,100
Industrial	831	16,400	655	16,700	719	17,600
Stone:						
Crushed	25,700	165,000	27,300	184,000	31,300	210,000
Dimension	9	850	9	850	9	850
Combined values of mica (crude), vermiculite (crude), and value indicated by symbol W	XX	(3)	XX	10,100	XX	(3)
Total	XX	460,000	XX	508,000	XX	532,000

eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined values" data.
XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value withheld to avoid disclosing company proprietary data.

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TABLE 2
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND[1]

	2002				2003				2004			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4	2,320	$14,700	$6.32	4	2,290	$14,500	$6.32	6	6,410	$32,600	$5.08
Marble	1	W	W	7.41	1	W	W	8.29	1	W	W	8.32
Calcareous marl	3	W	W	4.57	3	W	W	3.48	3	W	W	4.44
Granite	24	18,900	128,000	6.76	23	20,500	151,000	7.39	23	22,200	163,000	7.36
Total or average	XX	25,700	165,000	6.43	XX	27,300	184,000	6.75	XX	31,300	210,000	6.70

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3a
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	301	$1,910	$6.38
Riprap and jetty stone	W	W	13.02
Filter stone	W	W	13.81
Other coarse aggregates	395	4,520	11.43
Total or average	696	6,430	9.24
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	9.61
Bituminous aggregate, coarse	(2)	(2)	10.58
Bituminous surface-treatment aggregate	(2)	(2)	5.12
Railroad ballast	(2)	(2)	9.62
Other graded coarse aggregates	2,290	12,400	5.42
Total or average	8,540	70,300	8.23
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(2)	(2)	6.45
Screening, undesignated	(2)	(2)	10.39
Other fine aggregates	1,010	5,840	5.81
Total or average	2,100	13,800	6.56
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	6.46
Crusher run or fill or waste	(2)	(2)	6.26
Roofing granules	(2)	(2)	10.24
Other coarse and fine aggregates	1,740	14,200	8.15
Total or average	4,930	34,800	7.07
Chemical and metallurgical, cement manufacture	3,950	13,700	3.48
Unspecified:[3]			
Reported	6,760	43,200	6.39
Estimated	290	1,700	5.80
Total or average	7,040	44,900	6.37
Grand total or average	27,300	184,000	6.75

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.59
Riprap and jetty stone	W	W	13.25
Filter stone	W	W	14.46
Total or average	503	$5,810	11.55
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	9.55
Bituminous aggregate, coarse	W	W	10.61
Bituminous surface-treatment aggregate	W	W	6.49
Railroad ballast	W	W	9.85
Other graded coarse aggregates	33	180	5.45
Total or average	5,890	57,700	9.79
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	5.67
Stone sand, bituminous mix or seal	W	W	7.48
Screening, undesignated	247	2,510	10.15
Other fine aggregates	6	33	5.50
Total or average	1,900	11,900	6.28
Coarse and fine aggregates:			
Graded road base or subbase	4,140	26,400	6.37
Crusher run or fill or waste	719	4,650	6.47
Roofing granules	(2)	(2)	10.65
Other coarse and fine aggregates	139	1,220	8.78
Total or average	5,000	32,300	6.46
Chemical and metallurgical, cement manufacture	5,020	19,100	3.81
Unspecified:[3]			
Reported	12,800	81,700	6.39
Estimated	220	1,300	5.83
Total or average	13,000	83,000	6.38
Grand total or average	31,300	210,000	6.70

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	489	4,560	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Chemical and metallurgical[6]	--	--	W	W	W	W
Unspecified:[7]						
Reported	727	4,650	3,090	19,700	2,950	18,800
Estimated	--	--	160	1,000	130	640
Total	10,800	77,300	8,120	50,800	8,370	55,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, roofing granules, and other coarse and fine aggregates.

[6]Includes cement manufacture.

[7]Reported and estimated production without a breakdown by end use.

TABLE 4b

SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Chemical and metallurgical[6]	--	--	W	W	W	W
Unspecified:[7]						
Reported	3,690	23,000	3,750	23,900	5,360	34,800
Estimated	--	--	160	1,000	50	220
Total	11,800	84,900	9,520	56,000	10,000	69,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, and riprap and jetty stone.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, and other coarse and fine aggregates.

[6]Includes cement manufacture.

[7]Reported and estimated production without a breakdown by end use.

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TABLE 5a
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,650	$22,100	$6.00
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	530	2,000	3.56
Asphaltic concrete aggregates and other bituminous mixtures	356	947	2.80
Road base and coverings	58	361	2.29
Fill	789	1,420	1.71
Other miscellaneous uses	131	729	6.34
Unspecified:[3]			
Reported	7	27	5.53
Estimated	2,600	7,100	2.73
Total or average	10,100	34,700	3.45

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	3,480	$14,600	$4.18
Asphaltic concrete aggregates and road base materials	129	383	2.96
Fill	927	1,660	1.79
Other miscellaneous uses	41	73	1.79
Unspecified:[3]			
Reported	2,850	11,000	3.88
Estimated	2,500	7,400	2.91
Total or average	9,960	35,100	3.52

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	1,690	6,200	4,490	17,900
Asphaltic concrete aggregates and road base materials	W	W	W	W
Other miscellaneous uses[4]	263	850	1,070	2,610
Unspecified:[5]				
Reported	7	27	--	--
Estimated	400	1,300	2,200	5,800
Total	2,330	8,340	7,740	26,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes fill.
[5]Reported and estimated production without a breakdown by end use.

TABLE 6b
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	1,750	7,760	1,860	7,200
Fill	154	387	773	1,270
Other miscellaneous uses	--	--	41	73
Unspecified:[4]				
Reported	11	45	2,840	11,000
Estimated	370	1,200	2,200	6,100
Total	2,280	9,430	7,680	25,700

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes asphaltic concrete aggregates, plaster and gunite sands, and road base materials.
[4]Reported and estimated production without a breakdown by end use.

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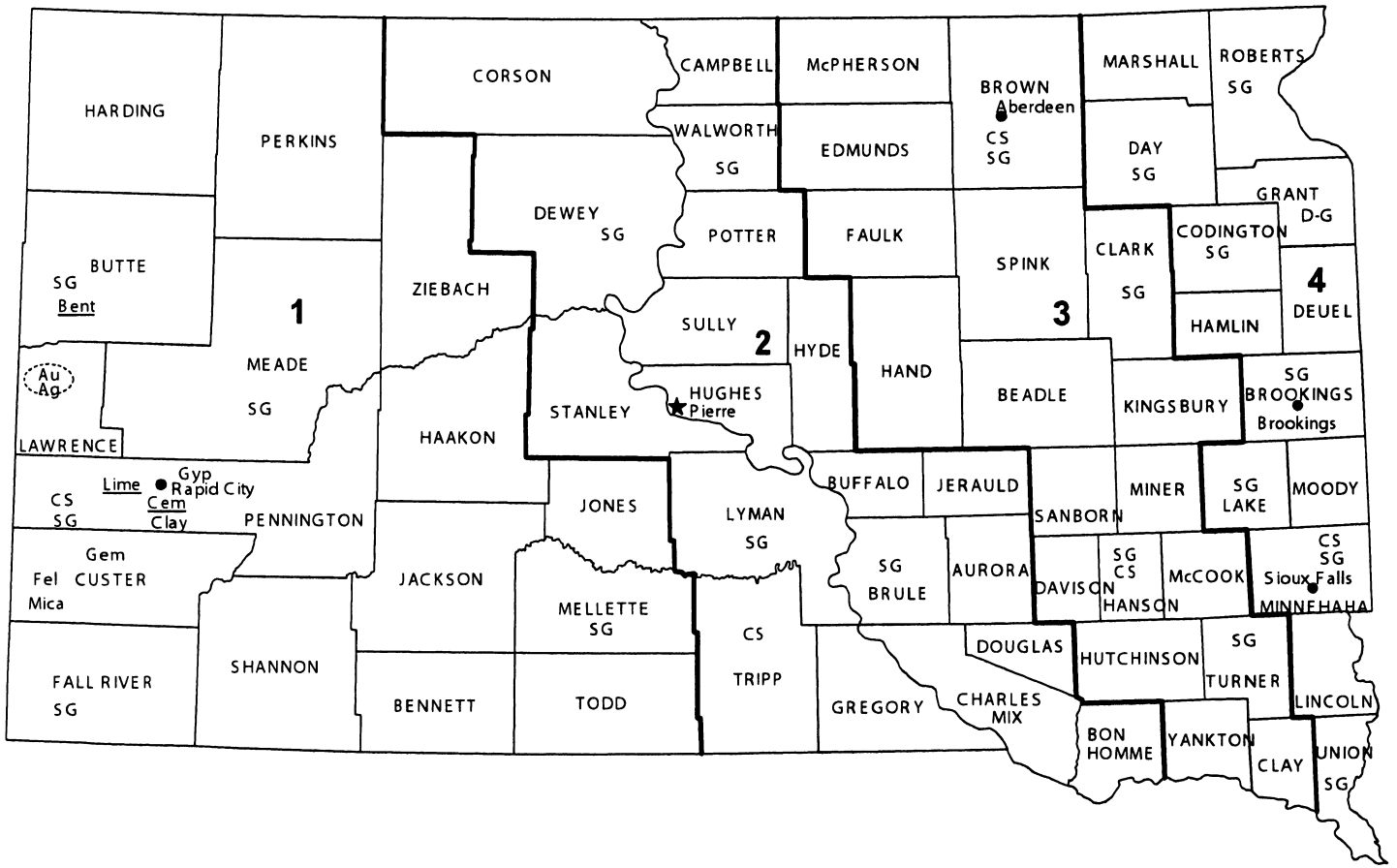
SOUTH DAKOTA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite mill
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
Lime	Lime plant
Mica	Mica
SG	Construction sand and gravel

Concentration of mineral operations

0 50 Kilometers

Source: South Dakota Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF SOUTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Dakota Geological Survey for collecting information on all nonfuel minerals.

In 2004, South Dakota's nonfuel raw mineral production was valued[1] at $210 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of 5.5% from State's total nonfuel mineral value for 2003[2], which was down nearly 8% from 2002.

Portland cement continued to be South Dakota's leading, by value, nonfuel mineral commodity in 2004, after having overtaken gold in 2002. Prior to 2002, gold had been the State's leading mineral commodity for more than four decades. The State's production of construction materials, which included (in descending order of value) portland cement, construction sand and gravel, crushed stone, granite dimension stone, common clays, and gypsum, accounted for about 79% of the State's total nonfuel mineral production value. In 2004, a nearly 19% increase in the production of construction sand and gravel resulted in a nearly $7 million rise in the commodity's value (table 1). The value of crushed stone increased $2.3 million. Smaller yet significant increases also took place in the values of gold and portland cement (descending order of change); the only decreases in value were those of dimension granite and common clays (company proprietary data).

In 2003, lime production rose, generating a significant increase in the commodity's total value, but this and other smaller increases were more than offset by a nearly $9 million drop in the value of crushed stone, smaller yet significant decreases in the values of gold and portland cement, and a $2.7 million decrease in the value of construction sand and gravel (table 1).

In 2004, South Dakota continued to be fifth (of 5 producing States) in the quantity of mica produced, seventh of 9 gold-producing States, and a significant producer of construction sand and gravel and granite dimension stone.

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources' (DENR) Minerals and Mining Program[3] (MMP) in cooperation with DENR's South Dakota Geological Survey. Production data in the text that follows are those reported by the MMP and based upon the agency's own surveys and estimates. Data may differ from some production figures reported to the USGS.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]E.H. Holm, T. Cline, Jr., and M. Macy, Natural Resources Project Engineer, Environmental Project Scientist, and Natural Resources Project Engineer, respectively, with the South Dakota Department of Environment and Natural Resources' Minerals and Mining Program, jointly authored the text of the State mineral industry information provided by that agency.

Exploration

Gold exploration activities in South Dakota continued to be limited despite higher gold prices. No exploration permits were issued in 2004, and only one of the large scale gold mines conducted exploration activities during the year. Wharf Resources (USA), Inc. completed seven exploration drill holes in the vicinity of its existing operation in Lawrence County.

In November and December 2003, Western Mining Corporation conducted nickel and copper exploration activities in southeastern South Dakota to test target areas of potential mineralization identified during an earlier airborne geophysical survey. But evaluation of the samples from the exploration program performed in the early months of 2004 indicated little potential for nickel and copper in the area; the company performed no further exploration in southeastern South Dakota in 2004.

Commodity Review

Industrial Minerals

During the 2004 reporting period, 500 companies and individuals had active mine licenses in South Dakota. An operator must obtain a license to mine for sand, gravel, pegmatite minerals, materials used in the process of making cement or lime, and rock to be crushed and used in construction. There were also 36 mine permits that cover mining other minerals such as bentonite, dimension stone, placer gold, and slate.

Crushed Stone.—Limestone regained the number two spot, measured in metric tons, among nonmetallic mineral commodities produced during 2004. Limestone production, according to the South Dakota DENR, was reported at 3.3 million metric tons (Mt), while Sioux quartzite production followed closely at 2.92 Mt. Limestone was produced in the Black Hills of western South Dakota and was used primarily in the production of cement and for construction projects. Sioux quartzite was quarried from four locations in southeastern South Dakota. Most of the quartzite was crushed and used in construction. Some larger blocks are used for rip-rap, railroad ballast, and occasionally for decorative purposes.

Dimension Stone.—A total of 327,000 metric tons (t) of dimension stone was mined by Dakota Granite Company and Cold Spring Granite Company from quarries near Milbank in northeastern South Dakota. Because of its beauty and distinctive red color, the "mahogany" granite was used primarily

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for monuments and building construction. Much of it went to international markets.

Sand and Gravel.—During 2004, sand and gravel was again the major nonmetallic mineral commodity produced with 14.3 Mt reported to the South Dakota DENR. Sand and gravel is produced in nearly every county in South Dakota and is used mainly for road construction projects.

Other Industrial Minerals.—Other nonfuel minerals and mineral materials produced in smaller amounts during 2004 include iron ore, mica, pegmatite minerals (feldspar, mica, and rose quartz), placer gold, shale, and slate. Pacer Corporation was issued a large-scale mine permit to expand its existing mica schist mine covered under Large Scale Mine Permit No. 311 on November 24, 2004. The operation will be expanded in a northwesterly direction and will include an additional 1.1 hectares. The reclamation plan for the mine is based on a post mine land use of grazing. Mining in the expansion area will begin in spring 2005 contingent on Pacer obtaining an operating plan from the U.S. Forest Service.

Metals

Gold.— Gold production decreased slightly in 2004, but the value increased slightly owing to the increase in gold prices. Based upon South Dakota DENR surveys and estimates, Homestake Mining Company, LAC Minerals, and Wharf Resources Inc. produced about 2,370 kilograms (kg) of gold in 2004. This represents a 3% decrease in the amount of gold produced compared with 2003. Wharf, the only major gold mine still operating, reported a 162-kg increase in gold production in 2004. Homestake recovered 2.8 kg of gold during the completion of mill demolition activities. LAC Minerals recovered 2.5 kg of gold during removal of sediments from its process ponds. Although production has lessened somewhat in recent years, gold continued to be one of the State's leading nonfuel mineral commodities, ranking third value after portland cement and construction sand and gravel (table 1). The average price of gold in 2004 was $409.72 per troy ounce, yielding an estimated gross value of about $31 million. This was 8.4% higher than the 2003 gross value of $28.6 million. The mines are surface heap-leach operations, with the exception of Homestake.

Silver.—Wharf was again the only company to report silver production, which is a byproduct of its gold recovery process. A total of 2,626 kg of silver was recovered in 2004 valued at $596,418. This is an increase from the 2,382 kg and $372,930 value reported in 2003.

In late August, Homestake shut down its wastewater treatment plant which has been in operation for the past 20 years. The plant, which was considered "state of the art" when it opened in 1984, will eventually be replaced by a new plant that will be constructed next to Homestake's Grizzly Gulch tailings impoundment. The impoundment will store water for treatment while the new plant is being constructed. The old plant will be mothballed and possibly used if the mine is chosen as the site for the national underground laboratory.

There are currently 11 mine permits that cover six large-scale gold mining operations in South Dakota. Wharf, the only gold mine still actively mining in South Dakota, holds four of these permits. No new mine permits or mine permit amendments were issued to large-scale gold operations in 2004.

Environmental Issues and Mine Reclamation

The U.S. Environmental Protection Agency (EPA) continued acid water treatment at the Gilt Edge Superfund Site in 2004. Adjustments were made throughout the year to improve the efficiency of the water treatment plant. The new plant, which was dedicated on September 19, 2003, treated 8.5 million liters of water per week after the adjustments were made. However, because of drought conditions and the lack of water to treat, the plant was shut down for the year on August 23, 2004.

The Golden Reward Mining Company completed reclamation activities required under its last five exploration permits in 2004. A closeout inspection was performed by the department staff in September 2004. In October 2004, the South Dakota Board of Minerals and Environment released Golden Reward from liability at these exploration sites.

Homestake made significant progress on reclamation projects at its historic gold mine in Lead during 2004. The company continued work on the new park in the former mill area. Homestake plans to open the park to the public in the spring of 2005. The company also began reclaiming the Yates Waste Rock Facility in July. Regrading and revegetation of the waste rock facility will be completed in 2005.

Work continued in 2004 on the conversion of the Homestake underground mine into an underground science laboratory to study neutrinos. A proposal to convert the lower portion of the underground mine into a laboratory was developed in 2004. The proposal was one of eight that was submitted to the National Science Foundation in February 2005. The Foundation will select two or three of the proposals later in 2005 for further development and funding.

Government Programs

During the past few years, EPA has been conducting a large-scale test to treat water in the Anchor Hill Pit using biological processes. After pH adjustments were made using lime and caustic, ethanol, molasses, and phosphoric acid were added to the water to enhance the growth of bacteria. The bacteria created conditions for metals precipitation. The goal of the test was to reduce the acidity and heavy-metal concentrations of the water so it could meet water quality standards and be discharged directly without further treatment. During 2004, the test entered its operational phase and EPA began planning to directly discharge water from the pit. After adding a filtration process, EPA's contractor discharged 379,000 liters of water from the pit. The process still needs additional work before it can be considered an alternative treatment method to the current water treatment plant. Additional discharges are planned for 2005.

The EPA and the State continued to prepare plans to reclaim the rest of the site, including the mine pits and heap-leach pad.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	208	W	213	W	188	W
Sand and gravel, construction	11,900	47,500	11,800	44,800	14,000	51,700
Stone, crushed	6,780	33,600	6,880	24,700	5,370	27,000
Combined values of cement (portland), feldspar, gemstones, gold, gypsum (crude), iron ore [usable (2002)], lime, mica (crude), silver (2002), stone (dimension granite), and values indicated by symbol W	XX	135,000	XX	130,000	XX	131,000
Total	XX	216,000	XX	199,000	XX	210,000

W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4	3,060	$12,800	$4.19	4	3,050	$10,900	$3.58	4	1,950	$9,150	$4.68
Granite	1	W	W	5.51	1	W	W	3.58	1	W	W	3.58
Quartzite	9	3,450	19,300	5.60	9	3,540	12,700	3.58	9	3,170	17,000	5.35
Slate	5	W	W	4.96	1	W	W	4.95	1	W	W	4.95
Total or average	XX	6,780	33,600	4.96	XX	6,880	24,700	3.58	XX	5,370	27,000	5.03

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3a
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Chemical and metallurgical, cement manufacture	W	W	$3.58
Unspecified:[2]			
Reported	5,410	$19,400	3.58
Estimated	1,500	5,300	3.58
Total or average	6,880	24,700	3.58

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 3b

SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$10.59
Filter stone	W	W	8.94
Total or average	48	$496	10.33
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.71
Bituminous aggregate, coarse	W	W	8.30
Railroad ballast	W	W	9.51
Other graded coarse aggregate	527	4,090	7.76
Total or average	868	6,800	7.83
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(2)	(2)	10.21
Other fine aggregate	456	1,930	4.22
Coarse and fine aggregates:			
Graded road base or subbase	W	W	8.43
Crusher run or fill or waste	W	W	7.16
Other coarse and fine aggregates	20	115	5.75
Total or average	25	157	6.28
Agricultural, other agricultural uses	8	15	1.88
Chemical and metallurgical, cement manufacture	(2)	(2)	2.59
Special, other fillers or extenders	(2)	(2)	4.53
Unspecified:[3]			
Reported	2,180	7,800	3.58
Estimated	510	5,100	10.02
Total or average	2,680	12,900	4.79
Grand total or average	5,370	27,000	5.03

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[3]Reported and estimated production without a breakdown by end use.

TABLE 4a

SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Chemical and metallurgical[3]	W	W	--	--	--	--
Unspecified:[4]						
Reported	1,870	6,700	603	2,160	2,940	10,500
Estimated	1,200	4,200	--	--	290	1,100
Total	3,050	10,900	603	2,160	3,230	11,600

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced in District 2.

[3]Includes cement manufacture.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4b
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	--	--	(4)	(4)	(4)	(4)
Coarse aggregate, graded[5]	--	--	(4)	(4)	(4)	(4)
Fine aggregate (-⅜ inch)[6]	--	--	(4)	(4)	(4)	(4)
Coarse and fine aggregate[7]	--	--	(4)	(4)	(4)	(4)
Agricultural[8]	--	--	(4)	(4)	--	--
Chemical and metallurgical[9]	W	W	(4)	(4)	--	--
Special[10]	--	--	(4)	(4)	--	--
Unspecified:[11]						
Reported	1,700	4,990	--	--	1,420	5,080
Estimated	250	4,200	--	--	250	900
Total	1,950	9,160	731	5,630	2,690	12,200

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone produced in District 2.
[3]Includes filter stone and riprap and jetty stone.
[4]Withheld to avoid disclosing company proprietary data; included in "Total."
[5]Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.
[6]Includes stone sand (bituminous mix or seal) and other fine aggregate.
[7]Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.
[8]Includes other agricultural uses.
[9]Includes cement manufacture.
[10]Includes other fillers or extenders.
[11]Reported and estimated production without a breakdown by end use.

TABLE 5a
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	440	$2,260	$5.13
Plaster and gunite sands	6	34	5.67
Concrete products (blocks, bricks, pipe, decorative, etc.)	9	94	10.44
Asphaltic concrete aggregates and road base materials[2]	4,830	15,100	3.13
Fill	359	976	2.72
Other miscellaneous uses[3]	84	384	4.57
Unspecified:[4]			
Reported	2,110	9,900	4.70
Estimated	3,900	16,000	4.13
Total or average	11,800	44,800	3.81

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes roofing granules and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 5b
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	522	$2,430	$4.64
Asphaltic concrete aggregates and other bituminous mixtures	571	1,530	2.68
Road base and coverings[3]	5,790	18,600	3.22
Fill	438	1,190	2.72
Snow and ice control	21	55	2.55
Other miscellaneous uses	19	150	7.73
Unspecified:[4]			
Reported	2,190	9,460	4.32
Estimated	4,500	18,000	4.10
Total or average	14,000	51,700	3.69

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Reported and estimated production without a breakdown by end use.

TABLE 6a
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	W	W	5	42
Asphaltic concrete aggregates and road base materials[3]	245	778	1,040	3,270	1,140	2,250
Fill	W	W	W	W	36	89
Other miscellaneous uses[4]	92	421	146	851	7	28
Unspecified:[5]						
Reported	651	2,980	192	685	216	1,110
Estimated	800	3,500	900	3,400	1,200	4,600
Total	1,770	7,690	2,260	8,160	2,570	8,150

	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	306	1,450	--	--
Asphaltic concrete aggregates and road base materials[3]	2,410	8,810	--	--
Fill	282	744	--	--
Other miscellaneous uses[4]	25	122	--	--
Unspecified:[5]				
Reported	1,030	5,080	20	55
Estimated	1,100	4,600	--	--
Total	5,150	20,800	20	55

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes roofing granules and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	W	W	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	458	1,150
Road base and coverings[3]	328	833	424	980	479	1,290
Fill	17	76	19	21	75	232
Other miscellaneous uses[4]	6	40	149	737	75	420
Unspecified:[5]						
Reported	346	1,320	122	390	9	32
Estimated	1,700	7,400	1,100	4,200	1,100	4,300
Total	2,370	9,690	1,780	6,340	2,230	7,450

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	324	1,400	--	--
Asphaltic concrete aggregates and other bituminous mixtures	105	331	--	--
Road base and coverings[3]	4,240	14,500	320	1,060
Fill	326	863	--	--
Other miscellaneous uses[4]	17	83	--	--
Unspecified:[5]				
Reported	1,710	7,730	--	--
Estimated	560	2,200	20	60
Total	7,280	27,100	340	1,110

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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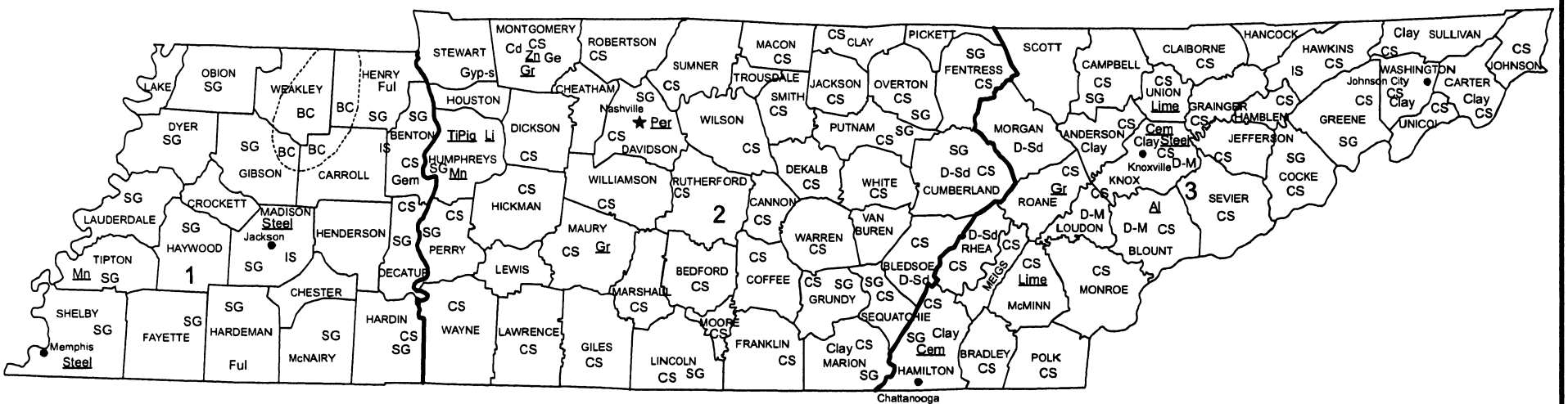
TENNESSEE



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant	CS	Crushed stone	Gyp-s	Synthetic gypsum	SG	Construction sand and gravel
BC	Ball clay	D-M	Dimension marble	IS	Industrial sand	Steel	Steel plant
Cd	Cadmium (See Zn)	D-Sd	Dimension sandstone	Li	Lithium plant	TiPig	Titanium dioxide pigment plant
Cem	Cement plant	Ful	Fuller's earth	Lime	Lime plant	Zn	Zinc plant (Cd byproduct cadmium) (Ge byproduct germanium)
Clay	Common clay	Gem	Gemstones	Mn	Manganese dioxide plant		
		Gr	Graphite plant	Per	Perlite plant		

Concentration of mineral operations

0 50 Kilometers

Source: Tennessee Department of Environment and Conservation, Division of Geology/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF TENNESSEE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Tennessee Department of Environment and Conservation, Division of Geology for collecting information on all nonfuel minerals.

In 2004, Tennessee's nonfuel raw mineral production was valued[1] at $653 million, based upon annual U.S. Geological Survey (USGS) data. This was a 4.8% increase from the State's total nonfuel mineral value for 2003[2], which was down 3.9% from 2002. Tennessee was 24th in rank (23d in 2003) among the 50 States in total nonfuel mineral production value and accounted for more than 1.4% of the U.S. total value.

Crushed stone has been Tennessee's leading nonfuel mineral commodity, by value, for nearly five decades (except in 1981 when zinc was first); crushed stone went ahead of cement (portland and masonry) in 1957. In 2004, crushed stone accounted for nearly 59% of the State's total nonfuel mineral production value. Cement was the second-leading nonfuel mineral commodity, followed by construction sand and gravel, ball clay, and lime. The largest increases in value for the year were from crushed stone, up $28 million, and cement (proprietary value). Smaller yet significant increases took place in the values of industrial sand and gravel, up $4.3 million, construction sand and gravel, up $3.4 million, and common clays, up $2.6 million (descending order of change). Gemstones also had a significant increase in value. The only substantial decrease in value took place in zinc.

In 2003, increases in the values of several mineral commodities, mostly in crushed stone (up $24 million) and cement (proprietary value), were more than offset by decreases in the values of zinc (proprietary value), construction sand and gravel (down nearly $8 million), and industrial sand and gravel (down nearly $4 million) resulting in the State's net decrease in value for the year.

In 2004, Tennessee continued to be the leading ball clay- and gemstone-producing State and eighth in the quantity of fuller's earth produced. The State rose to 10th from 11th in the production of crushed stone and remained a significant producer of portland cement, industrial sand and gravel, and common clays (descending order of value), but with substantially reduced zinc production it dropped to 5th from 3d in that metal commodity. Primary aluminum and raw steel were produced in Tennessee but were processed from materials obtained from other domestic and foreign sources. The State rose to sixth from eighth in rank in the production of primary aluminum.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The Tennessee Division of Geology[3] (TDG) provided the following narrative information. Data and information in the following text are those reported by the TDG, based upon its own surveys and estimates. By yearend 2004, approximately 330 nonfuel mineral operations were permitted in 82 counties across the State.

Commodity Review

Industrial Minerals

Clay.—Ball clay and kaolin were mined from the Eocene Claiborne and Wilcox Formations in Carroll, Gibson, Henry, and Weakly Counties, northwest Tennessee. Companies operating in the State were Boral Bricks Inc., Franklin Minerals Inc. (H.C. Spinks Co.), IMERYS (Kentucky-Tennessee Clay Co.), Old Hickory Clay Co., and Unimin Corp. (United Clays Inc). Fuller's earth (montmorillonite) was mined in Hardeman County by Moltan Co. and in Henry County by American Colloid Co.

On April 30, 2004, the Industrial Minerals Association-North America (IMA-NA) and the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) announced that the Old Hickory Clay Co. operation in Gleason, TN, received two joint safety recognition awards. The first award, the IMA-NA Safety Achievement Award, recognized the best reportable injury rate for 2003. The second award recognized Old Hickory for having more than 200,000 employee hours without a single reportable injury (Old Hickory Clay Company, 2004§[4]). Recently, H.C. Spinks Co. received the 2004 Safety Achievement Award presented annually by IMA-NA and MSHA. The award criteria evaluated a company's safety performance at all its U.S. facilities and non-U.S. mining sites in North America (H.C. Spinks Clay Company, Inc., 2004§).

Crushed Stone and Dimension Stone.—The crushed stone industry operated 157 quarries in 2004. Except for three quarries in Johnson County, which produced crushed granite and quartzite, limestone and dolomite were produced at 154 quarries and underground mines primarily in District 2 (middle Tennessee) and District 3 (east Tennessee). Crushed limestone and dolomite were produced in 66 counties by 43 different companies and 15 county highway departments. The top three producers expanded their operations in Tennessee in 2004. Vulcan Materials Co., which operated 43 quarries in 30 counties, acquired Columbia Rock Products and its limestone quarry to enter new markets in central Tennessee. Rogers Group

[3]Peter Lemiszki, Chief Geologist with the Tennessee Division of Geology in Knoxville, authored the text of the State mineral industry information provided by that agency.

[4]References that include a section mark (§) are found in the Internet References Cited section.

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Inc., which operated 34 quarries in 28 counties, acquired the assets of three quarries in Nashville, Harriman and Ten Mile from Martin Marietta Materials. Rinker Materials operated 12 quarries in 7 counties and acquired Loven Inc. premix concrete business, comprising six concrete plants in northeast Tennessee and Virginia. Existing Rinker Materials quarries will supply part of Loven's aggregate requirements. Loven operated five concrete plants in Greenville, Morristown, Newport, Kingsport, Johnson City, TN, and one in Bristol, VA.

Rogers Group received the 2004 Tennessee American Business Ethics Award in the midsize category. This honor recognized companies that exemplify high standards of ethical behavior in their everyday business conduct and in response to specific crises or challenges (Pit & Quarry, 2004§).

The Holston Limestone was quarried for dimension marble in Blount, Knox, and Loudon Counties by the Tennessee Marble Co. and Tennessee Valley Marble Inc. Tennessee Marble Co. acquired the Champlain Black Marble quarry in Isle La Motte, VT. The rich black marble is the only Class "A" black marble quarried in the United States (Stone World, 2004§).

Six companies operated eight dimension sandstone quarries in the Pennsylvanian Crab Orchard Sandstone in Bledsoe, Cumberland, Morgan, and Rhea Counties.

Gemstones.—The freshwater pearl was designated the official Tennessee State Gem in 1979. On April 12th 2004, the historic Tennessee River Freshwater Pearl Farm and Museum in Benton County was designated the official site of freshwater pearl culturing in Tennessee (Birdsong Resort, 2004§). The American Pearl Co. operated the only freshwater pearl farm in North America, which cultivated approximately 250,000 mussels each season. The mussels used for culturing freshwater pearls were native to the Tennessee River and were commonly referred to as the washboard and pigtoe varieties (Tennessee River Freshwater Pearls, 2004§). The American Shell Co., American Pearl Co., and Tennessee Shell Co. exported mollusk shells from the Tennessee River and to pearl-producing countries such as China, Japan, Tahiti, and Taiwan. Approximately 90% of all cultured pearls begin with a mother-of-pearl nucleus taken from the shell of a Tennessee mussel. Tennessee has in excess of $50 million in annual exports to foreign countries of the shells alone.

Sand and Gravel.—Construction sand and gravel was produced at 94 sites in 30 counties and was operated by 59 different companies, similar to 2003. The companies that operated at least five sites were Ford Construction Co., Memphis Stone and Gravel Co., and Standard Construction Co. in District 1 (west Tennessee) and Bradley Stone and Sand Inc. in the eastern part of District 2 (middle Tennessee). Industrial sand was mined in Hawkins County by Short Mountain Silica Co. and Fine Sands, LLC. Unimin Corp., which operated two industrial sand mines, was considered a major employer in Benton County. A new industrial sand quarry operated by Teague Transports, LLC was opened in Madison County.

Shale.—General Shale Brick (the U.S. subsidiary of Wienerberger AG, headquartered in Vienna, Austria) operated seven shale mines in Anderson, Carter, Knox, Sullivan, and Washington Counties in east Tennessee to supply its brick production plants. The 75-year-old company produces more than a billion bricks each year, supplying commercial, residential, and specialty architectural bricks and brick pavers. On December 3, 2004, it acquired Wittichen Lime and Cement, a brick and masonry package company headquartered in Memphis, TN. General Shale Brick, the Nation's second largest brick manufacturer, provided more than 200,000 bricks for the construction of East Tennessee State University's new Fossil Site Visitors Interpretive Center in Gray, TN. A groundbreaking ceremony for the 4,600-square-meter visitors' center was held November 16, 2004, while the expected opening date is the fall of 2006 (General Shale Brick, 2004§). Two other companies operated two shale mines in Hamilton and Marion Counties in southeast Tennessee.

Other Industrial Minerals.—Synthetic gypsum was produced from Tennessee Valley Authority byproducts at the Allied Custom Gypsum plant in Stewart County. Lime plants operated by Bowater Southern Paper Corp. in McMinn County produced high-calcium quicklime, and Global Stone Tenn-Luttrell Inc., in Union County, produced high-calcium quicklime and hydrated lime.

Metals

Zinc.—Zinc mining and processing operations have been suspended in all of Tennessee's zinc mines (Clinch Valley, Coy, Gordonsville, Immel, and Young). Tennessee Valley Resources (TVR) purchased the New Market and Young zinc mines in Jefferson and Knox Counties, previously owned by ASARCO Incorporated. TVR used the mines to supply limestone to produce agricultural limes and other limestone-base products.

Rogers Group, Inc. acquired 57 hectares of property and additional assets at the Gordonsville Mine in Smith County from Pasminco Ltd. (Rogers Group, Inc., 2003§). Rogers Group's acquisition of these assets will lengthen the life of this operation for more than 50 years and will provide a new open quarry mining area. The Coy Mine (Jefferson County) and the Immel Mine (Knox County) remained closed.

Pasminco closed the Clinch Valley Mine in Grainger County in March 2004 and then sold it to Mossy Creek Mining, LLC. Mossy Creek Mining, LLC, with locations in Gordonsville and Jefferson City, provided a quality agricultural-lime product used as a soil neutralizing agent.

Pasminco operated the electrolytic zinc plant in Clarksville (Montgomery County). The Clarksville zinc plant produced primary cadmium as a byproduct of roasting and leaching zinc concentrate. Production has been impacted in part by lower zinc grade of the raw materials following the closure of the Gordonsville Mine.

Government Programs

As part of the USGS STATEMAP program, the TDG completed 1:24,000-scale geologic maps and mineral resource summaries of the Mascot and Camelot quadrangles in 2004 and the Mosheim quadrangle in 2003. The Immel Mine in Knox County and the Beaver Creek Mine in Jefferson County are on the Mascot quadrangle in east Tennessee. These geologic maps have been produced in GIS format and are available as open-file publications through the Division of Geology's Nashville office.

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The TDG has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: FEDMAP, which funds Federal geologic mapping projects, STATEMAP, which is a matching-funds grant program with State geological surveys, and EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TENNESSEE[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Ball	660	28,100	766	33,400	762	34,300
Common	262	1,540	304	585	365	3,140
Fuller's earth	W	W	92 e	5,000 e	W	W
Sand and gravel:						
Construction	9,220	51,900	7,550	44,100	7,830	47,500
Industrial	1,070	25,700	961	21,800	975	26,100
Stone, crushed	54,900	330,000	55,100	354,000	57,900	382,000
Combined values of cement, clays [kaolin (2002, 2004)], gemstones, lime, salt, stone (dimension marble), zinc, and values indicated by symbol W	XX	212,000	XX	164,000	XX	160,000
Total	XX	648,000	XX	623,000	XX	653,000

eEstimated. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
TENNESSEE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	112 r	52,700 r	$317,000 r	$6.00 r	113	53,100	$340,000	$6.40	109	55,600	$365,000	$6.57
Dolomite	5 r	W	W	7.12 r	5	W	W	7.42	5	W	W	7.51
Granite	1	W	W	4.63	1	W	W	4.63	1	W	W	4.63
Sandstone	1	W	W	3.64	1	W	W	9.37	1	W	W	9.37
Total or average	XX	54,900	330,000	6.00	XX	55,100	354,000	6.42	XX	57,900	382,000	6.59

r Revised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	1,010	$6,920	$6.87
Filter stone	674	4,320	6.41
Other coarse aggregates	1,600	6,550	4.10
Total or average	3,280	17,800	5.43
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,800	12,400	6.91
Bituminous aggregate, coarse	W	W	7.28
Bituminous surface-treatment aggregate	W	W	6.04
Other graded coarse aggregates	3,640	24,000	6.59
Total or average	14,200	99,400	7.02
Fine aggregate (-⅜ inch):			
Stone sand, concrete	436	3,860	8.85
Stone sand, bituminous mix or seal	W	W	7.78
Screening, undesignated	W	W	6.95
Other fine aggregates	1,520	12,600	8.34
Total or average	3,730	28,900	7.75
Coarse and fine aggregate:			
Graded road base or subbase	8,060	47,600	5.90
Unpaved road surfacing	205	1,060	5.17
Crusher run or fill or waste	332	1,940	5.84
Other coarse and fine aggregates	2,310	14,600	6.35
Total or average	10,900	65,200	5.98
Agricultural limestone	203	1,650	8.13
Chemical and metallurgical:			
Cement manufacture	W	W	3.08
Lime manufacture	W	W	33.01
Sulfur oxide removal	W	W	6.12
Total or average	2,700	24,300	8.99
Special:			
Mine dusting or acid water treatment	W	W	5.51
Asphalt fillers or extenders	W	W	6.61
Other fillers of extenders	W	W	16.53
Total or average	254	3,600	14.19
Unspecified:[2]			
Reported	12,400	70,600	5.68
Estimated	7,500	43,000	5.72
Total or average	19,900	113,000	5.70
Grand total or average	55,100	354,000	6.42

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

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TABLE 3b

TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	954	$6,960	$7.29
Filter stone	801	5,090	6.35
Other coarse aggregates	1,370	7,460	5.44
Total or average	3,130	19,500	6.24
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,280	9,970	7.77
Bituminous aggregate, coarse	W	W	7.28
Bituminous surface-treatment aggregate	W	W	8.08
Railroad ballast	W	W	5.95
Other graded coarse aggregates	3,320	23,400	7.03
Total or average	15,600	113,000	7.24
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,120	9,060	8.08
Stone sand, bituminous mix or seal	(2)	(2)	6.40
Screening, undesignated	1,900	14,100	7.42
Other fine aggregates	2,060	16,700	8.08
Total or average	5,080	39,800	7.83
Coarse and fine aggregates:			
Graded road base or subbase	11,200	66,000	5.88
Unpaved road surfacing	177	1,010	5.72
Crusher run or fill or waste	448	2,490	5.55
Other coarse and fine aggregates	2,550	15,700	6.16
Total or average	14,400	85,200	5.92
Other construction materials	141	864	6.13
Agricultural limestone	279	2,110	7.58
Chemical and metallurgical:			
Cement manufacture	(3)	(3)	3.09
Lime manufacture	(3)	(3)	33.07
Sulfur oxide removal	(3)	(3)	6.12
Special:			
Mine dusting or acid water treatment	(3)	(3)	5.51
Other fillers of extenders	(3)	(3)	16.53
Unspecified:[4]			
Reported	9,590	52,300	5.45
Estimated	6,800	42,000	6.12
Total or average	16,400	94,100	5.73
Grand total or average	57,900	382,000	6.59

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	1,710	8,430	W	W
Coarse aggregate, graded[3]	W	W	W	W	6,780	46,700
Fine aggregate (-⅜ inch)[4]	W	W	1,140	8,290	W	W
Coarse and fine aggregate[5]	W	W	W	W	6,330	39,400
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	W	W	W	W
Unspecified:[9]						
Reported	512	3,080	9,490	52,400	2,410	15,100
Estimated	--	--	5,600	33,000	1,900	9,600
Total	3,690	23,800	28,700	169,000	22,700	161,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, lime manufacture, and sulfur oxide removal.

[8]Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 4b

TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	6,740	47,100
Fine aggregate (-⅜ inch)[4]	W	W	W	W	3,500	28,300
Coarse and fine aggregate[5]	W	W	W	W	5,860	36,800
Other construction materials	--	--	141	864	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	--	--	W	W
Unspecified:[9]						
Reported	287	1,720	6,520	33,300	2,790	17,200
Estimated	--	--	5,100	33,000	1,700	8,700
Total	3,090	21,400	30,600	187,000	24,200	173,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, lime manufacture, and sulfur oxide removal.

[8]Includes mine dusting or acid water treatment and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,630	$10,800	$6.67
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	416	3,380	8.13
Asphaltic concrete aggregates and other bituminous mixtures	1,460	8,240	5.66
Road base and coverings	1,040	4,780	4.58
Fill	119	705	5.92
Unspecified:[3]			
Reported	615	3,650	5.93
Estimated	2,300	13,000	5.43
Total or average	7,550	44,100	5.84

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	1,910	$13,700	$7.17
Asphaltic concrete aggregates and other bituminous mixtures	765	5,340	6.98
Road base and coverings[3]	358	1,710	4.77
Fill	128	808	6.31
Unspecified:[4]			
Reported	2,110	12,100	5.71
Estimated	2,600	14,000	5.43
Total or average	7,830	47,500	6.06

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2 and 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	966	6,790	1,080	7,430
Asphaltic concrete aggregates and road base materials	1,800	8,080	698	4,940
Fill	119	705	--	--
Unspecified:[4]				
Reported	495	2,750	120	900
Estimated	1,100	5,400	1,200	7,100
Total	4,470	23,700	3,080	20,400

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6b
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	721	5,670	1,190	7,990
Asphaltic concrete aggregates and road base materials[4]	W	W	W	W
Fill	127	804	1	4
Other miscellaneous uses	356	1,040	767	6,010
Unspecified:[5]				
Reported	1,940	10,900	167	1,130
Estimated	1,800	9,200	740	4,700
Total	4,970	27,700	2,860	19,800

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (cement).
[5]Reported and estimated production without a breakdown by end use.

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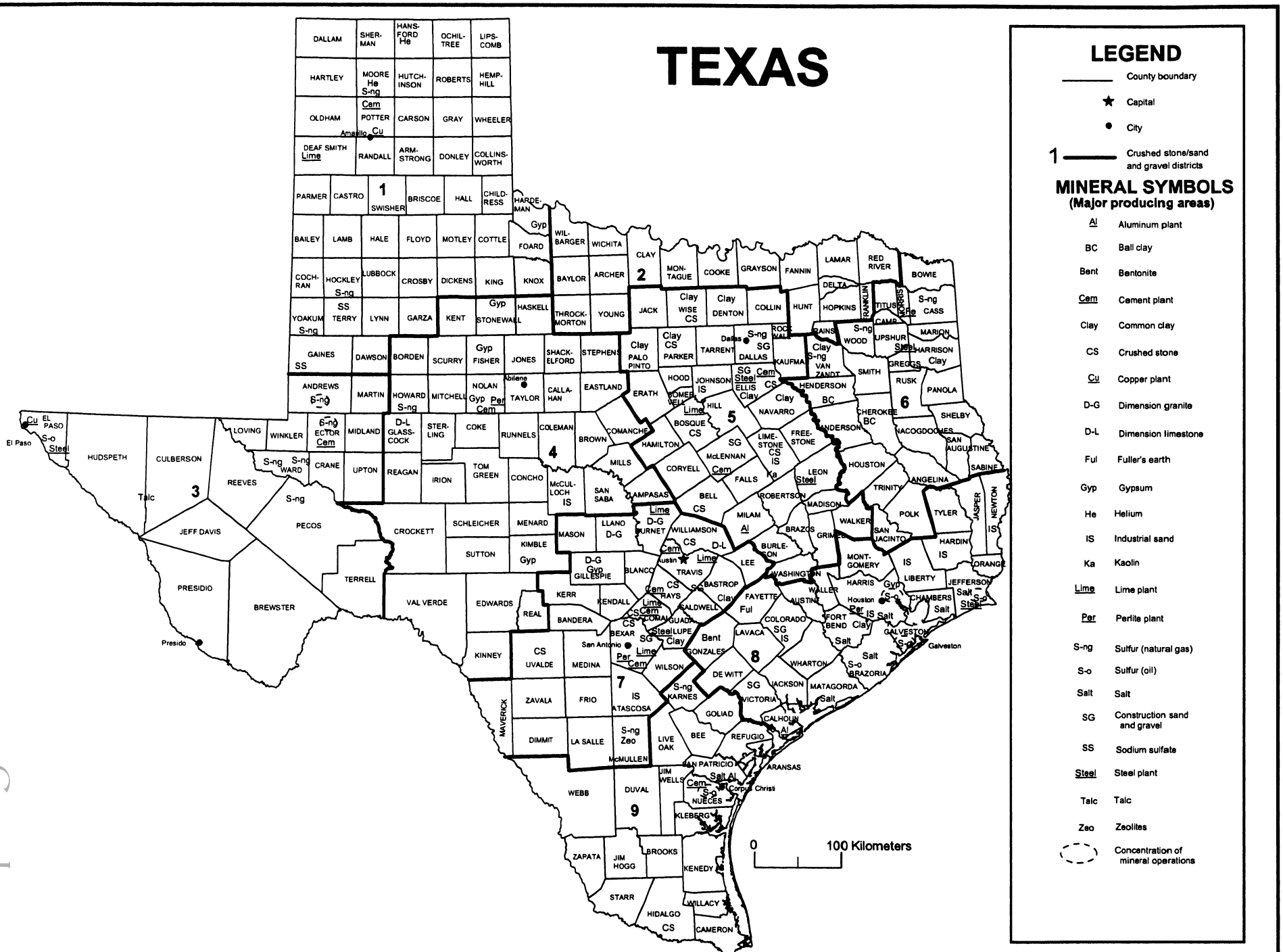

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THE MINERAL INDUSTRY OF TEXAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Texas at Austin, Bureau of Economic Geology, for collecting information on all nonfuel minerals.

In 2004, Texas nonfuel raw mineral production was valued[1] at $2.29 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 4.6% increase from the State's total nonfuel mineral value for 2003,[2] which followed a 5.3% increase from 2002. Texas was fifth among the 50 States (third in 2003) in total nonfuel mineral production value and accounted for 5% of the U.S. total value.

In 2004, about 91% of Texas' nonfuel mineral value resulted from the production of the State's top five industrial minerals, which are, in descending order of value—cement (portland and masonry), crushed stone, construction sand and gravel, salt, and lime. Cement alone accounted for nearly 37% of the State's total nonfuel mineral value. Even though there was only a relatively small increase in production, cement led all other nonfuel mineral commodities with an increase in value of $55 million. Industrial sand and gravel production rose 45%, its value up more than $27 million from 2003. The next highest increase in value came from the construction sand and gravel industry. Even though production was down about 5%, the commodity's value was up $11 million. Smaller yet significant increases in value also took place in crude gypsum (up $6.5 million), lime (up $5 million), and salt (up $2 million). The largest decrease in value was a $132 million drop in the value of crushed stone, which had a 3.2% drop in production (table 1). Significantly smaller decreases in value took place in ball clay, brucite, and dimension stone.

In 2003, Texas' rise in value was led by increases in the values of crushed stone, up $67 million, and industrial sand and gravel, up nearly $20 million. To follow were increases in the values of salt, up $13 million, construction sand and gravel and lime, each up $12 million, portland cement, up $7 million, and dimension stone, up $4.2 million (table 1). Although the production and value of crude helium had a significant increase, Grade–A helium production and value decreased, substantially.

In 2004, Texas continued to be first in rank among producing States in the quantity of crushed stone produced; second in the production of portland cement, construction sand and gravel, salt, crude helium (of two producing States), common clays, ball clay, and talc (listed in descending order of value); and seventh in masonry cement. Also the State was a significant producer of gemstones. While the State rose in rank to first from second in the production of brucite (of two producing States), to second from third in industrial sand and gravel, and to second from fifth in crude gypsum, it decreased to third from second in zeolites and to seventh from fifth in dimension stone. The Texas metal industry produced copper, primary aluminum, raw steel, and smaller amounts of other metals. Sources of plant feed included ores, blister and anode copper, and scrap metal acquired from other domestic or foreign sources. In 2004, the State rose to third from fourth in rank in primary aluminum production and was the leading producer of electrolytically refined copper. Texas also remained one of the Nation's leading raw steel-producing States (precise rank withheld owing to proprietary data of producers in other States). Production rose 5.6% in 2004 to 3.95 million metric tons of raw steel, as reported by the American Iron and Steel Institute (2005, p. 76).

The following narrative information was provided by the Texas Bureau of Economic Geology[3] (BEG). In 2004, the mineral industry remained a significant and diverse component of the Texas economy with most of the State's nonfuel minerals achieving increases in production and value from 2003. Annual job growth in natural resources and mining, as reported by the Texas Workforce Commission (2005§[4]), increased 2.5% from December 2003 through December 2004. This number includes mining and support services for nonfuel minerals as well as oil and gas extraction and coal mining. Steady though modest gains were made in the growth of the construction industry employment. The Commission reported an increase of about 1.2% in the number of jobs Statewide in 2004 more than the 0.5% increase of 2003.

Commodity Review

Industrial Minerals

Common Clays.—Hanson PLC acquired U.S. brick manufacturer Athens Brick Co. Inc. from Texas Industries, Inc. of Dallas, TX, for about $40 million in cash (on a debt-free basis and subject to usual post-closing adjustments). Athens Brick continued serving Texas and adjoining States from two plants in central northeastern Texas (one plant in Mineral Wells, Palo Pinto County, west of Fort Worth, and the other plant in Athens, Henderson County, southeast of Dallas) and a third plant near the Texas border in northwestern Louisiana (Mooringsport). These facilities produced facing brick used in residential and commercial construction and have a combined capacity of 90 million bricks per year. Texas Industries, Inc. completed an

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Sigrid Clift, Research Associate, Texas Bureau of Economic Geology, and J. Richard Kyle, Professor, both of the Department of Geological Sciences, John A. and Katherine G. Jackson School of Geosciences, University of Texas at Austin, coauthored the text of the State mineral industry information provided by the Texas Bureau of Economic Geology

[4]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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initial plan by which it would begin to spin off its wholly owned steel business.

Crushed Stone.—Hanson Aggregates North America reported its completion in 2004 of a major production facility, the Perch Hill Plant, which the company claimed to be one of the largest crushed stone producing plants in the State (Jerry McCalip, company official, Hanson Aggregates North America, Dallas, TX, oral commun., March 25, 2005).

Talc.—Zemex Industrial Minerals, Inc. reported that the Zemex Sonority Pioneer Plant outside of Van Horn was in full production during 2004. The company mined talc from three different pits to use in blending operations to produce products for its various customer specifications. Planned activities include an aggressive ore characterization drilling, sampling, and associated lab analysis program. This program was scheduled to start during the summer of 2005 and continue on a year-by-year basis (Steve Cox, company official, Zemex Industrial Minerals, Inc., Atlanta, GA, oral commun., March 25, 2005).

Legislation and Government Activities

The Texas Governor's Advisory Committee on Rock Crushers recommended tighter control over aggregate mining activities, especially to include reclamation language in connection with bonded mine sites. The creation of water districts in the State continued to introduce new restrictions to mine development. In the 2005 legislative session, SB1354 was introduced to address protection of extraordinary streams and included a pilot program designed for the Brazos River, which begins in Young County, west of Possum Kingdom Lake in northern central Texas.

Reference Cited

American Iron and Steel Institute, 2005, Pig iron and raw steel production-Final 2004, AIS-7, subsection of Annual statistical report 2004: Washington, DC, American Iron and Steel Institute, 130 p.

Internet Reference Cited

Texas Workforce Commission, 2005 (January), Texas nonagricultural wage and salary employment (seasonally adjusted), Texas Labor Market Review, accessed March 25, 2005, at URL http://www.tracer2.com/.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TEXAS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	294	36,000 e	307	36,100 e	319	38,000 e
Portland	10,500	740,000 e	11,100	747,000 e	11,200	800,000 e
Clays:						
Common	2,160	21,200	2,110	8,890	2,160	8,890
Fuller's earth	W	W	27	2,400	W	W
Kaolin	39	8,420	33	7,150	W	W
Gemstones	NA	12	NA	201	NA	201
Gypsum, crude	2,060	13,400	1,810	12,300	2,450	18,800
Lime	1,530	98,400	1,630	110,000	1,630	115,000
Salt	9,100	103,000	9,640	116,000	9,870	118,000
Sand and gravel:						
Construction	82,600	413,000	86,200	425,000	81,700	436,000
Industrial	1,670	62,200	1,930	81,700	2,790	109,000
Stone:						
Crushed	109,000 r	528,000 r	126,000	595,000	122,000	582,000
Dimension	65	12,200	87	16,400	64	15,200
Talc, crude	W	W	246	W	258	W
Combined values of brucite, clays (ball, bentonite), helium, zeolites (2004), and values indicated by symbol W	XX	40,900	XX	33,300	XX	46,300
Total	XX	2,080,000 r	XX	2,190,000	XX	2,290,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
TEXAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone [2]	118 r	104,000 r	$504,000 r	$4.85 r	111	121,000	$567,000	$4.69	114	116,000	$552,000	$4.76
Dolomite	1	W	W	4.34	1	W	W	3.99	1	W	W	4.33
Calcareous Marl	2	W	W	3.96	2	W	W	4.07	2	W	W	4.07
Marble	7	W	W	18.79 r	7	W	W	20.82	3	W	W	16.89
Shell	1	W	W	26.46	(3)	W	W	28.66	(3)	W	W	28.67
Granite	2	W	W	11.86 r	1	W	W	110.23	1	W	W	110.23
Traprock	1	W	W	8.61	1	W	W	7.93	1	W	W	8.08
Sandstone and quartzite	5	652 r	4,230 r	6.48 r	4	749	4,190	5.59	4	1,030	5,290	5.15
Volcanic cinder	2	W	W	4.36	--	--	--	--	--	--	--	--
Miscellaneous stone	9	1,850	7,370	4.00	8	1,930	9,860	5.10	9	2,220	10,800	4.85
Total or average	XX	109,000 r	528,000 r	4.86 r	XX	126,000	595,000	4.72	XX	122,000	582,000	4.79

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

[3]Sales/distribution yards.

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TABLE 3a

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	169	$1,410	$8.34
Filter stone	899	9,610	10.69
Other coarse aggregate	739	1,850	2.50
Total or average	1,810	12,900	7.12
Coarse aggregate, graded:			
Concrete aggregate, coarse	8,590	61,400	7.14
Bituminous aggregate, coarse	1,810	14,200	7.81
Bituminous surface-treatment aggregate	416	3,960	9.52
Railroad ballast	W	W	4.71
Other graded coarse aggregate	8,730	38,300	4.38
Total or average	19,600	118,000	6.02
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,310	8,550	6.51
Stone sand, bituminous mix or seal	286	1,470	5.15
Screening, undesignated	247	1,520	6.15
Other fine aggregate	5180	19,600	3.78
Total or average	7,030	31,100	4.43
Coarse and fine aggregate:			
Graded road base or subbase	18,100	65,400	3.62
Unpaved road surfacing	(2)	(2)	3.32
Terrazzo and exposed aggregate	(2)	(2)	126.89
Crusher run or fill or waste	342	1,410	4.12
Roofing granules	(2)	(2)	10.01
Other coarse and fine aggregates	5,280	32,700	6.19
Total or average	23,700	99,500	4.20
Other construction materials	26	121	4.65
Agricultural:			
Agricultural limestone	87	1,390	15.95
Poultry grit and mineral food	165	2,000	12.12
Other agricultural uses	76	739	9.72
Total or average	328	4,130	12.58
Chemical and metallurgical:			
Cement manufacture	13,200	36,500	2.77
Lime manufacture	2,330	8,670	3.73
Sulfur oxide removal	(3)	(3)	11.69
Special:			
Asphalt fillers or extenders	(3)	(3)	11.63
Other fillers or extenders	830	9,460	11.39
Other miscellaneous uses and other specified uses not listed	37	212	5.73
Unspecified:[4]			
Reported	49,300	233,000	4.73
Estimated	7,500	35,000	4.71
Total or average	56,800	268,000	4.73
Grand total or average	126,000	595,000	4.72

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data, included with "Other coarse and fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$13.81
Riprap and jetty stone	254	$1,730	6.83
Filter stone	268	1,610	5.99
Other coarse aggregates	1,030	6,720	6.54
Total or average	1,550	10,100	6.49
Coarse aggregate, graded:			
Concrete aggregate, coarse	8,640	63,900	7.40
Bituminous aggregate, coarse	1,660	13,200	7.98
Bituminous surface-treatment aggregate	188	1,990	10.57
Railroad ballast	(2)	(2)	6.81
Other graded coarse aggregates	3,750	30,600	8.17
Total or average	14,200	110,000	7.71
Fine aggregate (-⅜ inch):			
Stone sand, concrete	1,770	12,000	6.77
Stone sand, bituminous mix or seal	130	881	6.78
Screening, undesignated	132	823	6.23
Other fine aggregates	3,940	15,900	4.02
Total or average	5,980	29,600	4.95
Coarse and fine aggregate:			
Graded road base or subbase	9,750	39,500	4.05
Terrazzo and exposed aggregate	(3)	(3)	71.58
Crusher run or fill or waste	549	2,610	4.76
Other coarse and fine aggregates	10,300	49,100	4.79
Total or average	20,600	91,200	4.44
Other construction materials	80	264	3.30
Agricultural:			
Agricultural limestone	261	1,650	6.32
Poultry grit and mineral food	(4)	(4)	17.94
Other agricultural uses	143	1,960	13.71
Total or average	404	3,610	8.94
Chemical and metallurgical:			
Cement manufacture	10,700	33,600	3.13
Lime manufacture	(5)	(5)	3.44
Special:			
Asphalt fillers or extenders	(5)	(5)	11.34
Other fillers or extenders	393	2,620	6.65
Other miscellaneous uses and other specified uses not listed	22	124	5.64
Unspecified:[6]			
Reported	53,600	239,000	4.45
Estimated	12,000	51,000	4.29
Total or average	65,600	290,000	4.42
Grand total or average	122,000	582,000	4.79

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 4a

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	--	--	W	W	--	--	W	W
Coarse aggregate, graded[3]	W	W	W	W	--	--	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--	W	W
Coarse and fine aggregates[5]	W	W	362	1,480	W	W	W	W
Other construction materials	--	--	--	--	--	--	--	--
Agricultural[6]	--	--	W	W	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W	W	W
Special[8]	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--
Unspecified:[9]								
Reported	--	--	166	824	3,360	16,400	--	--
Estimated	220	890	--	--	550	2,600	320	1,600
Total	710	3,830	910	4,700	4,680	21,900	3,680	21,300

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	W	W
Coarse aggregate, graded[3]	11,900	57,900	--	--	4,750	32,100	W	W
Fine aggregate (-⅜ inch)[4]	W	W	--	--	1,660	10,900	--	--
Coarse and fine aggregates[5]	10,100	38,600	W	W	9,500	37,600	W	W
Other construction materials	--	--	--	--	26	121	--	--
Agricultural[6]	W	W	--	--	--	--	W	W
Chemical and metallurgical[7]	9,800	27,900	--	--	4,280	11,600	W	W
Special[8]	W	W	--	--	W	W	--	--
Other miscellaneous uses	9	52	--	--	28	161	--	--
Unspecified:[9]								
Reported	7,110	35,300	--	--	31,400	147,000	4,580	20,400
Estimated	4,900	22,000	30	140	1,300	7,300	--	--
Total	50,800	217,000	206	1,260	53,600	254,000	6,510	45,600

	District 9		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	--	--	--	--
Coarse aggregate, graded[3]	W	W	18	236
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregate[5]	W	W	387	3,500
Other construction materials	--	--	--	--
Agricultural[6]	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--
Special[8]	--	--	--	--
Other miscellaneous uses	--	--	--	--
Unspecified:[9]				
Reported	2,710	12,900	--	--
Estimated	130	510	--	--
Total	4,590	21,900	405	3,730

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement manufacture, lime manufacture, and sulfur oxide removal.

[8]Includes asphalt fillers or extenders and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 4b

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	--	--	--	--	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W	1,130	5,010
Other construction materials	--	--	--	--	--	--	--	--
Agricultural[6]	--	--	W	W	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W	W	W
Special[8]	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--
Unspecified:[9]								
Reported	--	--	173	860	3,230	15,600	--	--
Estimated	420	1,700	--	--	670	3,300	98	510
Total	748	3,760	610	2,770	4,580	21,400	3,740	21,100

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	1,400	8,960	W	W
Coarse aggregate, graded[3]	4,840	34,600	--	--	6,070	39,800	W	W
Fine aggregate (-⅜ inch)[4]	3,130	12,300	--	--	2,360	14,200	W	W
Coarse and fine aggregates[5]	2,150	11,100	W	W	14,100	54,000	W	W
Other construction materials	--	--	--	--	80	264	--	--
Agricultural[6]	W	W	--	--	W	W	W	W
Chemical and metallurgical[7]	6,890	22,800	--	--	W	W	--	--
Special[8]	W	W	--	--	W	W	--	--
Other miscellaneous uses	22	124	--	--	--	--	--	--
Unspecified:[9]								
Reported	18,300	70,100	--	--	24,300	117,000	4,780	21,300
Estimated	9,300	36,000	34	130	1,300	9,000	--	--
Total	45,500	197,000	238	1,170	54,300	258,000	6,850	50,200

	District 9		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	--	--	--	--
Coarse aggregate, graded[3]	W	W	33	493
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregate[5]	W	W	280	2,620
Other construction materials	--	--	--	--
Agricultural[6]	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--
Special[8]	--	--	--	--
Other miscellaneous uses	--	--	--	--
Unspecified:[9]				
Reported	2,830	13,500	--	--
Estimated	150	580	--	--
Total	4,810	24,000	313	3,120

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement and lime manufacture.

[8]Includes asphalt fillers or extenders and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a

TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	32,100	$184,000	$5.74
Plaster and gunite sands	324	2,420	7.47
Concrete products (blocks, bricks, pipe, decorative, etc.)	512	1,800	3.52
Asphaltic concrete aggregates and other bituminous mixtures	791	5,330	6.74
Road base and coverings	3,130	14,500	4.62
Road stabilization (cement)	1,210	8,140	6.72
Fill	10,700	26,400	2.47
Snow and ice control	12	37	3.08
Other miscellaneous uses	429	1,190	2.78
Unspecified:[2]			
Reported	10,800	53,800	4.98
Estimated	26,000	130,000	4.85
Total or average	86,200	425,000	4.93

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

TABLE 5b

TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	32,200	$199,000	$6.19
Plaster and gunite sands	449	3,990	8.90
Concrete products (blocks, bricks, pipe, decorative, etc.)	202	1,780	8.78
Asphaltic concrete aggregates and other bituminous mixtures	1,220	7,350	6.02
Road base and coverings	3,210	15,100	4.69
Road and other stabilization (cement)	1,460	8,430	5.78
Fill	6,740	18,700	2.78
Other miscellaneous uses[2]	207	1,050	5.06
Unspecified:[3]			
Reported	14,200	74,200	5.22
Estimated	22,000	110,000	4.88
Total or average	81,700	436,000	5.34

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filtration, roofing granules, and snow and ice control.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a

TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 3		Districts 2 and 6		Districts 4 and 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products [3]	975	8,820	W	W	3,480	20,300
Asphaltic concrete aggregates and road base materials [4]	509	3,890	W	W	328	1,480
Fill	230	1,290	102	150	870	2,620
Snow and ice control	1	7	W	W	--	--
Other miscellaneous uses	--	--	1,820	9,670	--	--
Unspecified:[5]						
Reported	1,550	7,730	148	688	4,550	25,600
Estimated	5,100	25,000	2,700	15,000	3,700	18,000
Total	8,350	46,500	4,730	25,400	12,900	68,000
	District 5		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products [3]	9,780	62,000	13,300	64,300	W	W
Asphaltic concrete aggregates and road base materials [4]	1,300	7,240	2,270	11,500	W	W
Fill	1,450	3,370	8,010	18,900	--	--
Snow and ice control	W	W	27	111	--	--
Other miscellaneous uses	370	889	54	291	4,350	27,700
Unspecified:[5]						
Reported	1,050	2,720	3,240	15,700	258	1,330
Estimated	5,500	25,000	6,300	30,000	2,900	15,000
Total	19,500	101,000	33,200	141,000	7,530	43,400

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 3, 2 and 6, and 4 and 7 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement).

[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b

TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 3		Districts 2 and 5		Districts 4 and 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	794	6,290	7,180	43,200	4,200	33,500
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	233	1,990	128	1,450
Asphaltic concrete aggregates and other bituminous mixtures	W	W	426	2,950	W	W
Road base and coverings[4]	169	1,500	1,360	8,590	W	W
Fill	114	398	983	2,290	1,300	7,510
Other miscellaneous uses[5]	78	855	33	331	918	2,930
Unspecified:[6]						
Reported	1,520	7,540	4,930	25,500	3,810	22,000
Estimated	2,800	14,000	6,300	33,000	2,900	15,000
Total	5,500	30,700	21,500	118,000	13,300	82,700

	Districts 6 and 8		District 9		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	13,200	71,700	3,740	25,800	3,070	18,700
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	52	206	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	--	--
Road base and coverings[4]	2,300	11,000	W	W	--	--
Fill	4,330	8,520	--	--	5	13
Other miscellaneous uses[5]	420	1,470	623	4,340	--	--
Unspecified:[6]						
Reported	3,620	17,400	218	1,090	131	641
Estimated	7,300	32,000	2,400	12,000	--	--
Total	31,200	142,000	6,990	43,200	3,200	19,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 3, 2 and 5, 4 and 7, and 6 and 8 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement).

[5]Includes filtration, roofing granules, and snow and ice control.

[6]Reported and estimated production without a breakdown by end use.

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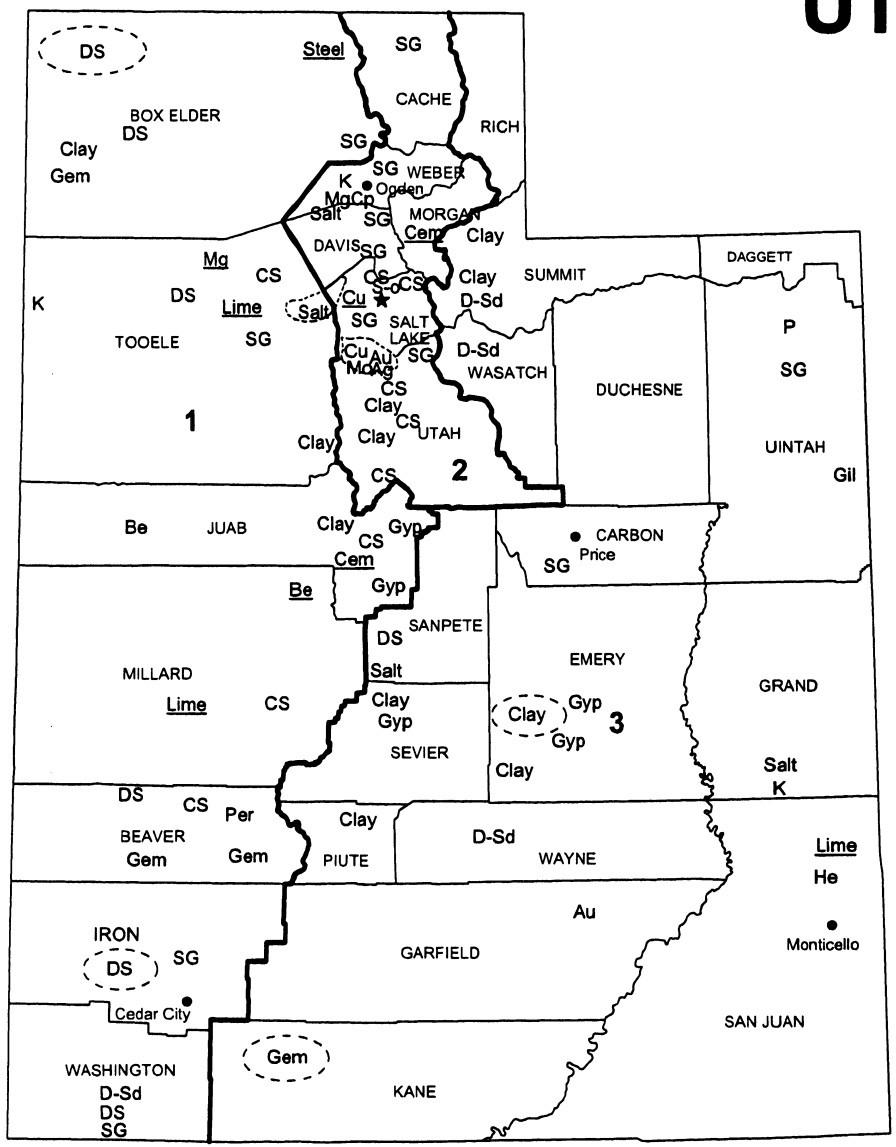
UTAH



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Be	Beryllium
Be	Beryllium plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-Sd	Dimension sandstone
DS	Dimension stone
Gem	Gemstones
Gil	Gilsonite
Gyp	Gypsum
He	Helium
K	Potash
Lime	Lime plant
Mg	Magnesium metal plant
MgCp	Magnesium compounds
Mo	Molybdenum
P	Phosphate rock
Per	Perlite
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

Source: Utah Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF UTAH

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Utah Geological Survey, for collecting information on all nonfuel minerals.

In 2004, Utah's nonfuel raw mineral production was valued[1] at $1.94 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of nearly 43% compared with the State's total nonfuel mineral value for 2003,[2] which was up nearly 10% from 2002. The State rose to 6th from 8th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 4% of the U.S. total value.

Metals accounted for about 69% of Utah's nonfuel mineral production value, and copper accounted for more than one-half of the State's entire metal value. In 2004, the most substantial changes were in the metals sector—the value of molybdenum concentrates was up by more than 400% and the values of copper and magnesium metal were up more than 40% each. The upward trend in molybdenum concentrate prices began in December 2002 and continued throughout 2003 and 2004. For example, the average annual price of molybdic oxide rose from $8.27 per kilogram in 2002 to $11.75 per kilogram in 2003 to $36.73 per kilogram in 2004 and reached $68.86 per kilogram in December 2004. Molybdenum concentrate prices remained high and continued to increase, although more gradually, during the early months of 2005. (Prices were reported in Platts Metals Week in dollars per pound of contained molybdenum.)

Other mineral commodities with significant increases in value in 2004 included potash, portland cement, construction sand and gravel (up $12 million), gold, phosphate rock, silver, and crushed stone (up about $5 million), lime, and common clays (up $2.3 million) (descending order of change) (table 1).

In 2003, Utah's increase in total value substantially resulted from an increase in copper production, accounting for the largest increase in value for a commodity for the year, value up more than 20%. This was followed by smaller yet significant increases in the values of—in descending order of change—magnesium metal, magnesium compounds, portland cement, construction sand and gravel (value up $9 million, although production was down slightly), salt, molybdenum concentrates, and crushed stone (up $2 million). The only substantial decrease in value was that of gold with significantly smaller decreases taking place in common clays and bentonite (table 1).

In 2004, nearly every commodity showed an increase in production; only bentonite and perlite showed decreases in the quantities produced. Utah continued to be the only State to produce beryllium concentrates and magnesium metal. The State remained second in rank in the quantities of copper and potash produced, as well as, third in molybdenum concentrates and gold, fourth in phosphate rock, silver, and perlite, fifth in bentonite, and sixth in salt. The State decreased to third from second in the production of magnesium compounds and also was a significant producer of portland cement, construction sand and gravel, lime, common clays, and gemstones (commodities listed in descending order of value).

The Utah Geological Survey (UGS)[3] provided the following narrative information. UGS production data were based upon its surveys, estimates, and information gathered from company annual reports. These data may differ from some USGS annual production figures, which were based upon USGS company surveys and estimates.

Exploration and Development Activities

The continued rebound in mineral commodity prices during 2004 significantly encouraged increased activity in the exploration and development sectors. Exploration in Utah began to increase in the last half of 2004, lagging somewhat behind increasing metal prices, and continued to improve into early 2005. During 2004, the Utah Division of Oil, Gas and Mining (DOGM) received 14 new notices of intent (NOIs) for exploration, of which nine were approved. Of the 14 NOI applications, eight were for precious metals, four for industrial minerals, and two for base metals. More than 2,900 claims were staked in Utah during the 2004 calendar year. Land acquisition for mineral exploration was particularly active in Beaver (copper and gold), Emery (uranium), Iron (gold and iron), San Juan (copper and uranium), Tooele (copper and gold), and Washington (gold) Counties. In addition, 84 State mineral leases were issued during the year, more than one-half of which were for metals (William Stokes, mineral resource specialist, Utah School and Institutional Trust Lands Administration, written commun., October 2005).

During 2004, DOGM received 13 large mine permit applications [2 hectares (ha) and larger land disturbance] and 18 new small mine permit applications (less than 2 ha disturbance). The 13 large mine permit applications included 3 new mine applications and 10 applications to change from a small mine permit to a large mine permit. All the small mine permits were for new operations.

Development activity started slowly within the State, but in the last half of 2004, several developments were initiated that will significantly add to Utah's metal mining sector. Two of the more significant developments were the beginning of construction of the Constellation Copper (Constellation)

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Kenneth Krahulec, Geologist, and Roger Bon, Industry Outreach Specialist, of the Utah Geological Survey authored the text of the State mineral industry information provided by that State agency.

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Corp.'s Lisbon Valley copper mine in southeastern Utah and the Kennecott Utah Copper Corp.'s (Kennecott) announcement of a $170 million expansion at its Bingham Canyon Mine (copper-molybdenum-gold-silver), 32 km southwest of Salt Lake City, that added nearly 148 million metric tons (Mt) of better-than-average-grade copper-molybdenum ore to the existing reserve. The Bingham Canyon Mine, which produced more than one-half of Utah's total value of all nonfuel minerals (more than $1 billion), celebrated a century of copper-gold-silver production in 2004. The main metal exploration and development areas are discussed below.

Bingham District

Work at Kennecott's Bingham Canyon Mine in 2004 focused on extending the mine life beyond 2013. The thrust of this work was a geotechnical program, infill resource-definition drilling in the pit, and mine dewatering. The geotechnical program consisted of geological mapping and modeling, core drilling, inclinometer and piezometer installation, and water well and horizontal drain drilling.

The economic and engineering study for a $170 million pit expansion to the northeast was approved in February 2005. In addition to the pit expansion, Kennecott will purchase new equipment, expand operations at the company's Copperton concentrator, and relocate and build facilities. The new pit design added nearly 150 Mt of better-than-average-grade copper-molybdenum ore that will extend mine life until 2017, and does not preclude future underground mining. Other mine options currently being considered are an additional open pit expansion, underground block caving, underground skarn mining, or any combination of the above. The targeting of deep porphyry and skarn mineralization was planned for 2005 (Rio Tinto, 2005, p. 48).

Gold Hill District

Dumont Nickel, Inc. continued exploration in the old Gold Hill mining district in western Tooele County in 2004 that it began in 2003. Dumont focused on bulk-minable gold and gold-copper targets, overall assembling an 87-square-kilometer (km^2) property position. The company defined five project areas within the district: the Kiewit property (gold), the old Cane Springs Mine area (a gold-bearing shear zone), the IBA property in the southwestern part of the district (copper-silver-gold), the Clifton Shears zone area (a northeast-trending zone with more than 40 shear zones that contained gold, silver, lead, and zinc), and an unspecified jasperoid silica-breccia zone area (gold). Work in 2003 and 2004 included drilling 16 core holes totaling 2,260 m, collecting 5,200 soil samples over a 54 km^2 area, and taking 2,500 rock samples over a 24 km^2 area. The most successful exploration work in 2004 took place in the Kiewit area, where the historic Kiewit gold zone of quartz stockwork was delineated in granodiorite. This zone was tested by five holes totaling 465 m of drilling. Two drill sites were chosen 60 m apart, and a fan of three holes was drilled from one site and two from the other. Each of the five holes cut were drilled at between 6.6- to 43.7-m intervals and had 1.0 gram per metric ton (g/t) gold or greater at shallow depths. Additional definition drilling was planned for 2005 (Dumont Nickel, Inc., 2005§[4]).

Iron Springs-Pinto District

In 2004, Palladon (65% joint-venture ownership) and WUCC (35% joint-venture ownership) laid the groundwork for entering into an agreement with Iron Ore Mines LLC to purchase its iron properties in the Iron Springs-Pinto mining district in southwestern Utah for $10 million, which was completed in late January 2005. Iron Ore Mines' property contains two iron deposits, the Comstock/Mountain Lion and the Rex. The Iron Springs-Pinto District has been one of the most productive iron ore districts in the western United States. The bulk of the district's production took place between 1923 and 1995, with its most productive period between 1947 and 1965 while being operated by U.S. Steel Corporation.

The Iron Ore Mines' property contains approximately 2,000 ha of patented mining claims, other fee lands, and an additional 400 ha of unpatented mining claims. The measured reserve remaining in the Comstock/Mountain Lion pits was 25 Mt of ore averaging 47.1% iron with a stripping ratio of 0.3 cubic meters waste per metric ton of ore. The Rex deposit, which has never been mined, contained a measured reserve of 89.1 Mt of ore averaging 39.1% iron with a 15% iron cutoff grade and could be amenable to open pit mining. Near the Comstock/Mountain Lion deposit are several low-grade stockpiles estimated to contain about 12.5 Mt of ore averaging 42% iron (Wray, 2005§).

Lisbon Valley Mining District

The Lisbon Valley mining district in northeastern San Juan County (southeastern Utah) was one of the most active exploration areas in the State in 2004. Companies actively acquired land in the district for copper and uranium, but most actively pursued copper exploration and development. Constellation had the most advanced project in the district where the company was constructing an open pit, heap-leach, solvent extraction – electrowinning (SX-EW) operation. Copper production was expected to begin in September 2005, with full production by yearend. The three currently planned open pits are typically 30 to 46 meters (m) deep with roughly a 0.1% copper cutoff grade. The Utah portion of the Lisbon Valley copper project has a 7-year expected mine life based on a reserve of 33.3 Mt averaging 0.51% copper. Capital costs were projected to be $55 million with an annual cost of $18 million in goods and services, $10 million in taxes, and $9 million in wages for a staff of 146. The Lisbon Valley project is projected to produce 25,000 metric tons per year (t/yr) of copper with cash costs of about $1.10 per kilogram (kg) of copper and a total cost, including overhead, of $1.65 per kilogram. (Parkison and Thorson, 2005; Washnock, 2005). The mine initially will produce about 16,300 metric tons per day (t/d) of ore with a 2.25 to 1 stripping ratio, and at full capacity, the mining rate will be 54,500 t/d of ore.

[4]References that include a section mark (§) are found in the Internet References Cited section.

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A used processing plant was purchased and moved from the porphyry molybdenum-copper mine near Tonopah, NV. In 2004, all the facilities were relocated to a laydown yard at Lisbon Valley. Mined ore will pass through a primary and secondary crusher, agglomerated with sulfuric acid to jumpstart the leaching, and then stacked to create the heap-leach pad. The pregnant liquor from the leach pad will then be pumped to the SX-EW facility for processing. The leach pads will be triple-lined and the acid will come from the Kennecott smelter near Salt Lake City. Tests show that the oxide ores are expected to leach in about 30 days, mixed ores (oxide-sulfide) in roughly 120 days, and sulfide ores in more than 150 days (Parkison and Thorson, 2005; Washnock, 2005).

Constellation obtained all required permits from the State, closed on a $33 million financing package, and made an initial deposit on four new Komatsu 730E[5] haul trucks [186-metric ton(t) capacity] and one new Komatsu WA1200 wheel loader (34.3-cubic-meter bucket capacity). The company commenced construction of the foundations for the crushing and SX-EW processing facilities in November 2004. Exploration continued for additional copper reserves, in the mine area and along trend.

Marysvale District

Unico, Inc. continued exploration to delineate zinc-silver-copper-lead-gold resources in the Upper Deer Trail Mine and the PTH Tunnel workings in the Marysvale District in Piute County. Initial work consisted of surface rock-chip sampling and underground confirmation sampling of old mine assays. A preliminary round of 28 reverse-circulation holes testing the Upper Deer Trail Mine served to focus further work to the north and above the existing workings. Phase 2 drilling was designed to test known mineralized horizons in the PTH Tunnel area for new mineralization at depth. In addition to exploration work, significant improvements and additions were made to the mine's surface infrastructure (W.D. Proctor, chief geologist, Unico, Inc., written commun., December 2005).

Milford Area

In late 2003, Palladon Ventures, Ltd. optioned a 65% interest in Western Utah Copper Co.'s (WUCC) Milford area properties in the Rocky, Beaver Lake, San Francisco, and Blue Mountain areas in Beaver County. Palladon initiated an aggressive exploration program of drilling and geophysical surveys in 2004. In total, the company drilled 73 exploration and confirmation holes totaling more than 10 kilometers (km) on its 24,000-ha property. Drilling at the Maria open pit (three holes), the Hidden Treasure Mine (three holes), and the Sunrise ore body (seven holes) confirmed previous mining grades. The best of these stepout holes was PMA-2 at Maria, which cut 46 m of mineralization averaging 1.86% copper with minor gold-silver-molybdenum-tungsten mineralization, and PSU-2 at Sunrise, which intersected 53 m of mineralization running 1.81% copper. Weak supergene chalcocite mineralization was intersected by drilling southwest of the OK Mine (18 holes). Seven holes testing the Comet breccia pipe cut narrow intervals of gold-copper mineralization (Dave Hartshorn, company official, Palladon Ventures Ltd., written commun., December 2005).

The Palladon/WUCC joint venture completed phase I of a two-phase program of detailed induced polarization (IP) and ground magnetic surveying. Phase I covered areas hosting known mineral resources to define the geophysical expression of mineralization and to examine potential extensions of the currently defined resources. The geophysical program showed that significant IP chargeability, resistivity, and magnetic anomalies associated with the known mineralization and provided some potential drill targets at depth. Phase 2 of the program, expected to begin in February 2005, was planned to cover potential copper porphyry areas (Palladon Ventures, Ltd., 2005§).

Tintic District

Atlas Mining Co. was in the process of reopening the old Dragon halloysite mine in the southern part of the Tintic mining district (northeastern Juab County). Halloysite is an unusual, bright-white, microtubular, high-value clay that, because of its distinctive structure, is used in specific ceramic, paint, and other unique applications. Atlas has driven a 90-m-long, 15-degree decline into the halloysite deposit, where they have drifted about 18 m using a small road header, installed a chain crusher (100% to minus 325 mesh), and built an air classifier; the company began test mining in late 2004. Atlas anticipates a mining rate of 900 to 1,800 metric tons per month (t/mo), based on market demand (William Jacobson, President and CEO, Atlas Mining Co., oral commun., November 2005).

Commodity Review

Industrial Minerals

Industrial-minerals production, valued at more than $643 million, was at an alltime high and was the second largest contributor to the value of nonfuel minerals produced statewide in 2004 (behind base metals). The value of industrial minerals has increased substantially during the past 5 years; based upon UGS estimates and surveys it has increased from $500 million in 2000 to $643 million in 2004, a 29% increase. The commodities or commodity groups that realized significant gains included crushed stone and sand and gravel; lime and portland cement; and salines, including magnesium chloride, potash (potassium chloride), salt, and sulfate of potash (SOP). These commodities account for about 90% of the total value of the industrial minerals segment. Other important commodities produced in Utah, in descending order of value, include phosphate, gilsonite, expanded shale, common clay, bentonite, and gypsum.

Bentonite and Clays.—Based upon UGS surveys, approximately 100,000 t of bentonite and about 282,000 t of common clay were produced by eight companies in 2004, which was a 64% increase in the amount of bentonite produced and a

[5]Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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45% increase in common clay compared with 2003. The total value was estimated to be about $6.1 million. Two companies [Western Clay Co. and Redmond Inc. (holding company for Redmond Minerals)] mined bentonite from pits in central Utah, mostly for use as an additive to oil- and gas-drilling fluids, a binder in foundry molds, a pet-waste absorbent (litter-box filler), and a sealant. Statewide, there were 27 mine permits held by clay operators in 2004, many of these mines operated intermittently. In descending order of production, the three largest producers of common clay were Interstate Brick Co., Interpace Industries, and Ash Grove Cement Co. More than 75% of all common clay was used in the manufacture of brick. ECDC Environmental, LLC (ECDC) intermittently produced clay for use at its waste disposal facility near the town of East Carbon in Carbon County. Sufficient stockpiled material will preclude any additional clay mining by ECDC in the foreseeable future.

Construction Sand and Gravel and Crushed Stone.—Construction sand and gravel and crushed stone (including limestone and dolomite) were the leading contributors to the value of industrial minerals produced in Utah during 2004 (up from the third-highest in 2003); these commodities had an estimated value of $201 million, which was about $61 million (44%) more than in 2003. These materials are produced in nearly every county in Utah by commercial operators and by Federal, State, and county agencies. Because of the large number of operations (approximately 122 active sand and gravel pits and 20 stone quarries), the UGS did not send production questionnaires to this group. However, production data for 2004, as compiled by the USGS, showed production of 29.8 Mt of sand and gravel with a value of $125 million and 8.0 Mt of crushed stone with a value of nearly $45 million. Crushed stone production included raw material for cement and lime plants. In comparison, 2003 values were 27.4 Mt of sand and gravel and 7.8 Mt of crushed stone.

Gilsonite.—Gilsonite production for 2004 of about 63,600 t (up from nearly 52,000 t in 2003) was estimated to be valued at approximately $22.3 million. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. All the gilsonite mines were located in southeastern Uintah County. The three companies that produced gilsonite were, in descending order of production, American Gilsonite Co., Zeigler Chemical and Minerals Co., and Lexco, Inc.

Gypsum.—In 2004, six companies produced about 380,000 t of gypsum (nearly 32,000 t more than in 2003) valued at approximately $2.6 million. In descending order of production, the three largest producers were U.S. Gypsum Co., H.E. Davis and Sons, and Nephi Gypsum, Inc. U.S. Gypsum operated the only active wallboard plant in Utah near the town of Sigurd in Sevier County. The Georgia-Pacific Gypsum Corp. plant, which was also near Sigurd, closed in 2002 and the company's mines in Utah operated only intermittently. Georgia-Pacific shifted wallboard manufacturing to the company's Las Vegas, NV, facility.

Most gypsum produced in Utah was used for making wallboard, but several operators supplied raw gypsum to regional cement companies, where it was used as an additive to retard the setting time of cement, and to the agricultural industry for use as a soil conditioner.

Lime and Portland Cement.—Lime and portland cement were the second-leading industrial minerals by value that were produced in 2004 (down from first in 2003), with a combined value of $180 million, which was about $13 million (8%) more than 2003. Lime production was about 12% higher in 2004 than in 2003, with an estimated production of more than 600,000 t. There were two suppliers of lime in Utah, with a combined capacity of more than 900,000 t/yr—Graymont, which was approximately 56 km southwest of Delta in Millard County and produced dolomitic quicklime and high-calcium quicklime; and Chemical Lime Co., which was about 13 km northwest of Grantsville in Tooele County and produced dolomitic quicklime and hydrated lime. Both operations served markets in Utah and the surrounding States. An additional 13 to 15 operators quarried about 2 Mt of limestone and dolomite in 2004, which was used mainly for construction as well as fluegas desulfurization in coal-fired powerplants. A small amount of dolomite and limestone was also crushed to a fine powder and marketed as rock dust to the coal mining industry.

Two operators produced portland cement in Utah: Ash Grove Cement Co. and Holcim (US), Inc. Ash Grove Cement's Leamington plant and limestone quarry were east of Lynndyl in Juab County, and Holcim's Devil's Slide plant and limestone quarry were east of Morgan in Morgan County. The companies had a combined production capacity of more than 1.4 million metric tons per year (Mt/yr) of cement. Both plants operated at about capacity in 2004, and, according to the UGS, produced a total of nearly 1.5 Mt. In addition to limestone, Ash Grove Cement and Holcim mined modest amounts of sandstone and shale that were used in the manufacture of cement.

Perlite.—Two companies, Utelite Corp. and Basin Perlite Co., produced lightweight expanded products from perlite and shale for use primarily in the construction and building industries. Combined production was about 290,000 t in 2004. Utelite manufactures expanded shale for use as a lightweight aggregate from its mine located east of the town of Wanship in Summit County. Basin Perlite manufactures expanded perlite that is used mainly in building construction products from its North Pearl Queen perlite mine located northeast of the town of Milford in Beaver County.

Phosphate Rock.—Simplot Phosphates LLC (formerly SF Phosphates), Utah's only phosphate producer, produced about 3.5 Mt (UGS estimate) of ore in 2004, which was about 5% more than that produced in 2003. The company's phosphate operation, located 18 km north of Vernal in Uintah County, produced roughly 2.7 to 3.6 Mt/yr of ore, which was processed into 0.9 to 1.8 Mt of phosphate concentrate. The concentrate was transported in slurry to the company's Rock Springs, WY, fertilizer plant by way of a 144-km-long underground pipeline.

Salt and Other Brine-Derived Products (Magnesium Chloride and Potash).—Brine-derived products, which included salt, were the third-highest contributors (down from second highest in 2003) to the value of industrial minerals production in Utah during 2004; they had a combined value of $179 million, which was about $24 million (15%) greater

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than in 2003. The statewide production of salt and other brine-derived products, excluding magnesium metal, was estimated to be 3.44 Mt in 2004, which was about the same as 2003. Potash production, including sulfate of potash (SOP's), was estimated to be about 450,000 t in 2004, approximately 86,000 t more than 2003. In addition to salt, brine-derived products included magnesium chloride and potash (potassium chloride and SOP). One company (North Shore Limited Partnership) produced a small amount of concentrated, mixed brine that was used as an ingredient in mineral food supplements.

Salt production alone was estimated to be at least 2.7 Mt in 2004, which was about 200,000 t more than in 2003, with most of the production coming from three operators that processed brine from the Great Salt Lake. These operators were, in descending order of production, Great Salt Lake Minerals Corp., Cargill Salt, and Morton International Inc. In addition, three other companies produced salt and/or potash from operations that were not on Great Salt Lake; they were Moab Salt, LLC, which was near Moab in Grand County (salt and potash); Redmond Inc., which was near Redmond in Sanpete County (salt); and Reilly Industries Inc. at Wendover, which was in Tooele County (salt and potash). In the second half of 2004, Intrepid Mining, LLC (the owner of Moab Salt) purchased the Reilly Wendover plant.

Metals

Base-metal production, estimated to be about $1.14 billion (an alltime high), was the largest contributor to the value of nonfuel minerals produced in Utah in 2004. Those metals were, in descending order of value, copper, molybdenum, magnesium metal, and beryllium (value not available). The 2004 base-metal value was about $446 million (65%) greater than that of 2003. Precious-metal production was valued at $158 million, including gold (85% of total value) and silver (15% of total value). In 2004, precious-metal values were $21.8 million, or 16%, more than in 2003. Overall, metal prices essentially doubled between 2001 and 2004, with 2004 being the strongest year since the early 1980s. Kennecott's Bingham Canyon Mine in Salt Lake County, was the State's sole producer of copper and molybdenum and the major producer of gold and silver. The combined value of minerals produced from the Bingham Canyon Mine was more than one-half of the total value of all minerals produced statewide in 2004.

Beryllium.—Utah continues to be the Nation's sole producer of beryllium concentrates. Beryllium ore (bertrandite) was mined at Brush Resource's Topaz and Hogs Back Mines in Juab County and processed along with stockpiled beryl at the company's plant 18 km northeast of Delta in Millard County. The product (beryllium hydroxide) was then sent to the company-owned refinery and finishing plant in Ohio, where it was converted into beryllium metal, alloys, and oxide; also, some of the product was sold to other companies. In 2004, nearly 15,000 t of ore was mined and trucked to the processing plant. (Based upon Brush Resources' 2004 Annual report, the USGS estimates that as much as 35,000 t of ore may have been processed, containing an estimated 88 t of beryllium.) The mine produced substantially less ore than in previous years owing to increased processing of stockpiled ore.

Copper.—Copper was the largest contributor to the value of nonfuel minerals in Utah. Substantial price increases in 2003 and 2004 raised the value of copper near to an alltime high, also raising the total value of base-metal production statewide to more than $1 billion for only the second time. Copper prices rebounded in 2003 and 2004, closing the year 2004 at more than $3.30 per kilogram and averaging $3.00 per kilogram. Copper production from Kennecott's Bingham Canyon Mine decreased slightly in 2004 to approximately 264,000 t from 2003 production of approximately 282,000 t of copper metal. Kennecott reports that the Bingham Canyon Mine produces more than 10% of the annual refined copper requirements in the United States (Rio Tinto, 2005, p. 48).

Gold and Silver.—In 2004, gold production was estimated to be about 9,950 kg, a 3% decrease from the production in 2003. Gold was produced from two surface mines owned by Kennecott, one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine), both located in Salt Lake County. Several other small mines in the State are known to produce minor amounts of gold and silver, but their minor metal-specific production was not reported and was not included in the above totals. The Barneys Canyon Mine ceased mining in late 2001, but continued to produce gold from its heap-leach pads at a much reduced rate and it is anticipated that this will continue into 2006. The Bingham Canyon Mine produced slightly more gold in 2004 than 2003. Silver was also a byproduct metal from the Bingham Canyon Mine, production was estimated at approximately 109,000 kg in 2004, basically unchanged from 2003.

Magnesium.—Magnesium metal was the third largest contributor to the value of base metals in 2004. Magnesium metal was produced from Great Salt Lake brines by U.S. Magnesium LLC at its electrolytic plant in Rowley, Tooele County. The plant's capacity was 43,000 t/yr of magnesium metal (99.8% purity); it is the only active primary magnesium production facility in the United States. In September 2004, the company announced that it would increase plant capacity to 51,000 t/yr through the addition of a third line of electrolytic cells (Platts Metals Week, 2004). The line was expected to begin production in June 2005 and be at full capacity in 2006. Magnesium metal prices reached a 12-year low in 2003, but increased substantially during 2004. U.S. Magnesium LLC also produces magnesium alloys, magnesium chloride, and other byproduct chemicals.

Molybdenum.—The sole molybdenum producer in Utah was Kennecott's Bingham Canyon Mine, which produced about 6,500 t of byproduct molybdenum in 2004, about 37% more than in 2003. The Bingham Canyon Mine was one of only seven molybdenum-producing mines in the United States in 2004. Recent price increases in molybdenum have surpassed those of the other metals, the average annual price surging more than five-fold from $5.20 per kilogram in 2001 to $36.73 per kilogram in 2004. The USGS reports that the total U.S. mine output of molybdenum increased by 24% in 2004 (Magyar, 2005).

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Environmental Issues and Mine Reclamation

Significant progress on several Utah environmental concerns took place in 2004. The U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), Utah Department of Environmental Quality (UDEQ), and Utah DOGM are nearing completion of remediation work at several old base-metal mill and smelter sites in western Utah and uranium plant sites in southeastern Utah. The base-metal projects included work at the Eureka mills (Tintic), International smelter (Tooele), Flagstaff/Davenport smelter (Cottonwood Canyon), and Jacobs smelter (Stockton). In southeastern Utah, reclamation included work at the Monticello and Moab uranium-mill tailings piles.

The DOE issued the draft environmental impact statement (EIS) on the Atlas uranium-mill tailings pile located 5 km northwest of Moab near the Colorado River. The preferred alternative, backed by the Utah State government, is for active ground water remediation and offsite tailings disposal at Crescent Junction. Federal legislation to fund this proposal was awaiting U.S. Congressional approval.

Agreement was reached between the three parties in UDEQ's Southwest Jordan Valley Project, which was designed to cleanup ground water contaminated from mining activities in the West Mountain District in southwestern Salt Lake County. During the next 40 years, extraction and treatment of ground water will remove sulfate contaminants and provide municipal-quality drinking water to the public in the affected area. By removing the contaminated water from the underlying aquifer, the project will improve ground water quality and prevent further migration of the contamination.

The Utah DOGM's abandoned mine reclamation program completed work on 89 individual mining sites during 2004. This program included three projects in the Cottonwood Wash uranium-vanadium district of San Juan County (53 sites) and one project in the Leamington base-metal district in the Fishlake National Forest of Millard County (36 sites). An additional 16 projects are in various stages of assessment and planning (Mark Mesch, program administrator, Abandoned Mine Reclamation, DOGM, written commun., September 2005).

Legislation and Government Programs

In 2002, the Utah State legislature passed the Utah Mined Land Reclamation Act (Section 40-8-1). This law governs the inspection, regulation, and reclamation of mining activities as well as provides for liabilities and penalties for violation of these rules. The new rules (R647-6) were promulgated by the Utah DOGM in June 2004 (Tom Munson, senior reclamation specialist/hydrologist, Minerals Reclamation Program, written commun., December 2005).

The UGS continued mapping projects in several regions of the State. The UGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated national Cooperative Geological Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: FEDMAP, which funds Federal geologic mapping projects, STATEMAP, which is a matching-funds grant program with State geological surveys, and EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In addition to STATEMAP, FEDMAP and EDMAP mapping projects are also active in the State.

Information on geology, maps, and publications could be found at the UGS Web site at URL http://geology.utah.gov. The Web site also contains information on geologic hazards, energy resources, mineral collecting, educational resources for teachers, and online publications, which included survey notes and other topics related to the geology of Utah.

Outlook

The value of mineral production was projected to increase again in 2005 owing to anticipated production increases for most nonfuel minerals with higher unit values of all base and precious metals, and the same for most major industrial minerals. Base- and precious-metal prices increased significantly in 2003 and 2004, and were projected to remain near or above their respective 2004 yearend prices during 2005. Industrial-mineral prices also were expected to remain firm, although a reduction in demand for several commodities is projected for the latter portion of the year.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN UTAH[1, 2]

(Thousand metric tons and thousand dollars)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Beryllium concentrates	metric tons	1,970	NA	2,100	NA	2,210	NA
Clays:							
Bentonite		W	W	W	W	73	W
Common		349	5,010	300	3,270	443	5,600
Gemstones		NA	230	NA	233	NA	235
Salt		2,090	113,000	2,200	119,000	2,250	107,000
Sand and gravel, construction		27,600	104,000	27,400	113,000	29,800	125,000
Stone, crushed		7,640	38,100	7,820	40,100	8,020	44,900
Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone (dimension sandstone), and values indicated by symbol W		XX	980,000	XX	1,080,000	XX	1,660,000
Total		XX	1,240,000	XX	1,360,000	XX	1,940,000

NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
UTAH: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	12	4,510	$24,800	$5.50	12	4,090	$17,200	$4.20	12	3,810	$25,700	$6.75
Dolomite	3	2,080	7,450	3.59	3	2,090	8,190	3.92	3	2,860	10,400	3.62
Sandstone and quartzite	5	W	W	4.71	6	W	W	6.09	6	767	4,870	6.34
Volcanic cinder and scoria	3	W	W	5.22	2	W	W	20.36	2	W	W	19.66
Miscellaneous stone	7	283	2,270	8.03	6	557	3,680	6.61	6	576	3,660	6.35
Total or average	XX	7,640	38,100	4.99	XX	7,820	40,100	5.12	XX	8,020	44,900	5.59

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

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TABLE 3a
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.42
Riprap and jetty stone	W	W	6.78
Filter stone	W	W	6.43
Total or average	134	$881	6.57
Coarse aggregate, graded:			
Bituminous aggregate, coarse	W	W	6.42
Bituminous surface-treatment aggregate	W	W	6.42
Railroad ballast	W	W	6.34
Total or average	447	2,830	6.34
Fine aggregate (-⅜ inch), stone sand (bituminous mix or seal)	(2)	(2)	6.42
Coarse and fine aggregates:			
Graded road base or subbase	146	570	3.90
Unpaved road surfacing	W	W	2.76
Crusher run or fill or waste	W	W	6.43
Total or average	356	1,920	5.38
Agricultural:			
Agricultural limestone	W	W	25.26
Poultry grit and mineral food	W	W	28.48
Total or average	14	376	26.86
Chemical and metallurgical:			
Cement manufacture	W	W	3.83
Lime manufacture	W	W	4.21
Sulfur oxide removal	W	W	10.80
Total or average	3,850	16,000	4.15
Unspecified:[3]			
Reported	2,460	15,200	6.16
Estimated	560	2,900	5.17
Total or average	3,020	18,000	5.98
Grand total or average	7,820	40,100	5.12

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 3b

UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	$5.51
Coarse aggregate, graded, railroad ballast	W	W	6.66
Fine aggregate (-⅜ inch), screening, undesignated	W	W	2.20
Coarse and fine aggregates:			
Graded road base or subbase	(2)	(2)	5.79
Unpaved road surfacing	(2)	(2)	2.76
Terrazzo and exposed aggregate	(2)	(2)	28.80
Crusher run or fill or waste	(2)	(2)	6.32
Other coarse and fine aggregates	7	$23	3.29
Total or average	59	520	8.81
Agricultural:			
Agricultural limestone	(2)	(2)	27.46
Poultry grit and mineral food	(2)	(2)	27.59
Other agricultural uses	4	13	3.25
Total or average	17	381	22.41
Chemical and metallurgical:			
Cement manufacture	(2)	(2)	3.73
Lime manufacture	(2)	(2)	12.66
Sulfur oxide removal	(2)	(2)	9.00
Total or average	3,550	23,700	6.68
Special, mine dusting or acid water treatment	W	W	19.30
Unspecified:[3]			
Reported	3,180	12,700	4.01
Estimated	660	3,700	5.59
Total or average	3,840	16,400	4.28
Grand total or average	8,020	44,900	5.59

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	--	--	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[4]	--	--	(5)	(5)	--	--	--	--
Coarse and fine aggregate[6]	W	W	W	W	W	W	--	--
Agricultural[7]	W	W	W	W	--	--	--	--
Chemical and metallurgical[8]	W	W	W	W	W	W	--	--
Unspecified:[9]								
Reported	308	6,280	1,720	6,170	19	112	412	2,610
Estimated	280	1,600	270	1,300	--	--	--	--
Total	3,690	21,300	3,610	15,400	117	795	412	2,610

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, and riprap and jetty stone.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

[4]Includes stone sand (bituminous mix or seal).

[5]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[6]ncludes crusher run (select material or fill), graded road base or subbase, and unpaved road surfacing.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes cement manufacture, lime manufacture, and sulfur oxide removal.

[9]Reported and estimated production without a breakdown by end use.

TABLE 4b

UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	--	--	--	--	(3)	(3)	--	--
Coarse aggregate, graded[4]	W	W	--	--	--	--	--	--
Fine aggregate (-⅜ inch)[5]	--	--	W	W	--	--	--	--
Coarse and fine aggregate[6]	W	W	W	W	--	--	--	--
Agricultural[7]	W	W	W	W	--	--	--	--
Chemical and metallurgical[8]	W	W	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--	--	--
Unspecified:[10]								
Reported	1	2	2,690	9,650	37	212	471	2,990
Estimated	180	950	380	2,200	95	550	--	--
Total	3,120	23,600	4,300	17,500	132	757	471	2,990

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone.

[3]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[4]Includes railroad ballast.

[5]Includes screening (undesignated).

[6]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[8]Includes cement manufacture, lime manufacture, and sulfur oxide removal.

[9]Includes mine dusting or acid water treatment.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,530	$7,330	$4.80
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	51	266	3.52
Asphaltic concrete aggregates and other bituminous mixtures	1,000	4,570	4.57
Road base and coverings[3]	3,550	13,400	3.78
Fill	1,950	4,220	2.17
Snow and ice control[4]	35	109	3.11
Other miscellaneous uses	34	56	1.65
Unspecified:[5]			
Reported	8,100	34,300	4.24
Estimated	11,000	48,000	4.36
Total or average	27,400	113,000	4.12

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

TABLE 5b
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,730	$9,170	$5.29
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	44	264	6.01
Asphaltic concrete aggregates and other bituminous mixtures	640	3,960	6.19
Road base and coverings[3]	4,410	17,000	3.85
Fill	2,170	5,200	2.40
Snow and ice control	19	54	2.89
Other miscellaneous uses[4]	361	1,700	4.71
Unspecified:[5]			
Reported	9,410	39,000	4.14
Estimated	11,000	48,000	4.38
Total or average	29,800	125,000	4.18

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes railroad ballast and roofing granules.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6a

UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	451	1,700	618	2,890	336	2,150
Asphaltic concrete aggregates and other bituminous mixtures	W	W	69	305	W	W
Road base and coverings[3]	W	W	1,490	5,390	W	W
Fill	282	713	1,390	2,610	273	905
Other miscellaneous uses[4]	834	3,590	35	58	1,480	6,330
Unspecified:[5]						
Reported	2,100	8,830	5,520	24,300	87	297
Estimated	2,300	15,000	7,800	29,000	1,000	4,500
Total	6,020	30,000	17,000	64,300	3,170	14,200

	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]	171	849
Asphaltic concrete aggregates and other bituminous mixtures	469	1,810
Road base and coverings[3]	242	642
Fill	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	389	851
Estimated	--	--
Total	1,270	4,150

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes railroad ballast and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b

UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	708	3,640	670	3,020	398	2,780
Asphaltic concrete aggregates and other bituminous mixtures	285	2,230	W	W	268	1,380
Road base and coverings[3]	904	3,680	1,510	5,100	1,640	7,190
Fill	542	1,430	1,150	2,640	419	974
Other miscellaneous uses[4]	75	952	304	805	5	31
Unspecified:[5]						
Reported	3,000	12,000	5,400	24,000	640	2,500
Estimated	2,100	15,000	7,900	30,000	1,000	3,800
Total	7,650	39,100	16,900	64,900	4,420	18,600

Use	Unspecified districts	
	Quantity	Value
Concrete aggregates and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W
Road base and coverings[3]	361	996
Fill	52	157
Other miscellaneous uses[4]	81	314
Unspecified:[5]		
Reported	358	592
Estimated	--	--
Total	852	2,060

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes railroad ballast, roofing granules, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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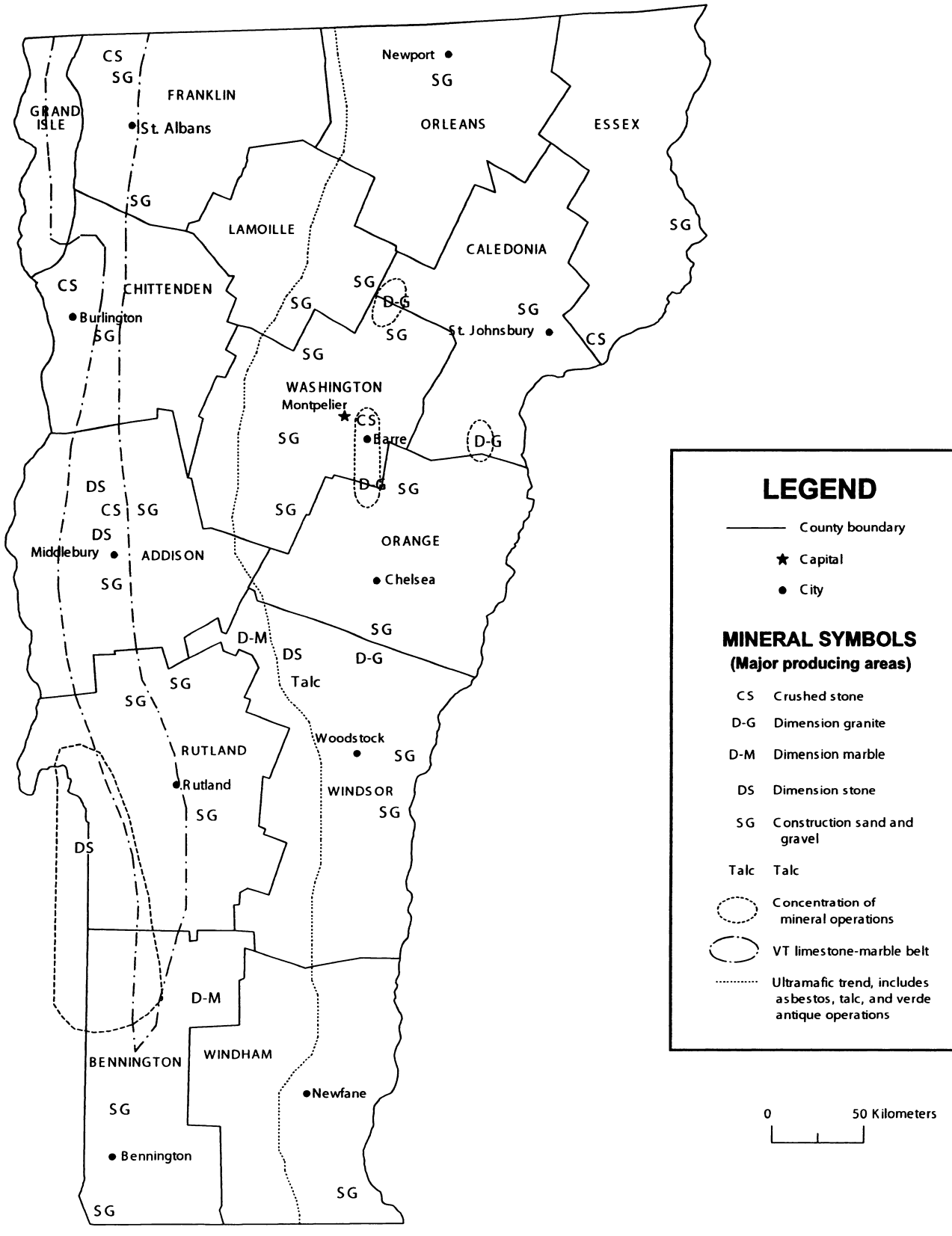
VERMONT



LEGEND

- County boundary
- ★ Capital
- ● City

MINERAL SYMBOLS
(Major producing areas)

CS	Crushed stone
D-G	Dimension granite
D-M	Dimension marble
DS	Dimension stone
SG	Construction sand and gravel
Talc	Talc
◯	Concentration of mineral operations
⬭	VT limestone-marble belt
·····	Ultramafic trend, includes asbestos, talc, and verde antique operations

0 50 Kilometers

Source: Vermont Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF VERMONT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Vermont Geological Survey for collecting information on all nonfuel minerals.

In 2004, Vermont's nonfuel raw mineral production was valued[1] at $85.4 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 19% increase from the State's total nonfuel mineral value for 2003,[2] which was up 1.7% from 2002. (Because data for talc have been withheld to avoid disclosing company proprietary data, the actual total values for 2002-04 are higher than those reported in table 1.)

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

In 2004, crushed stone and dimension stone were Vermont's leading nonfuel mineral commodities, accounting for a nearly identical 36.1% and 35.8%, respectively, of the State's publishable nonfuel mineral production value. All three of the State's major nonfuel mineral commodities (construction sand and gravel, crushed stone, and dimension stone) showed increases in value. A 19% increase in crushed stone production led to a 29%, or nearly $7 million, increase in the commodity's value. With slightly less production for the year, but a higher average unit value, the overall value of dimension stone rose nearly $4 million. Construction sand and gravel production also increased, its value up nearly $2.9 million (table1). In 2004, Vermont continued to be ranked third in the quantity of talc produced among 6 States and was fourth (third in 2003) among the States that produced dimension stone.

In 2003, a $2.6 million increase in the value of crushed stone outweighed decreases in construction sand and gravel and dimension stone, resulting in an increase for the year (table 1).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VERMONT[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002		2003		2004	
		Quantity	Value	Quantity	Value	Quantity	Value
Gemstones		NA	1	NA	1	NA	1
Sand and gravel, construction		4,990	22,200	4,520	21,100	4,970	24,000
Stone:							
Crushed		4,360	21,300	4,290	23,900	5,110	30,800
Dimension		101	27,000	102	26,700	100	30,600
Talc, crude	metric tons	W	(3)	W	(3)	W	(3)
Total		XX	70,600	XX	71,800	XX	85,400

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
VERMONT: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	6	1,680	$7,160	$4.26	6	1,180	$6,620	$5.61	6	1,400	$7,840	$5.61
Dolomite	3	W	W	8.00	3	W	W	8.29	3	W	W	8.32
Granite	3	192	1,250	6.51	3	346	2,960	8.55	3	258	2,250	8.72
Marble	1	W	W	4.08	1	W	W	4.08	1	W	W	4.08
Quartzite	1	W	W	4.74	1	W	W	4.74	2	W	W	8.60
Slate	1	W	W	4.85	1	W	W	4.96	1	W	W	4.90
Total or average	XX	4,360	21,300	4.88	XX	4,290	23,900	5.57	XX	5,110	30,800	6.03

W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

VERMONT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.95
Riprap and jetty stone	7	$72	10.29
Filter stone	34	280	8.23
Total or average	41	352	8.59
Coarse aggregate, graded:			
Concrete aggregate, coarse	25	248	9.92
Bituminous aggregate, coarse	(2)	(2)	11.59
Bituminous surface-treatment aggregate	(2)	(2)	12.68
Railroad ballast	(2)	(2)	9.09
Total or average	161	1,790	11.10
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(2)	(2)	8.82
Screening, undesignated	(2)	(2)	8.21
Total or average	37	315	8.51
Coarse and fine aggregates:			
Graded road base or subbase	311	2,540	8.16
Unpaved road surfacing	209	1,200	5.75
Crusher run or fill or waste	(3)	(3)	4.68
Other coarse and fine aggregates	129	712	5.52
Total or average	649	4,450	6.86
Unspecified:[4]			
Reported	977	6,010	6.15
Estimated	2,400	11,000	4.52
Total or average	3,410	17,000	4.99
Grand total or average	4,290	23,900	5.57

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b
VERMONT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Riprap and jetty stone	W	W	$9.27
Filter stone	W	W	11.49
Other coarse aggregates	9	$53	5.69
Total or average	51	459	9.00
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	10.49
Bituminous aggregate, coarse	W	W	11.57
Bituminous surface-treatment aggregate	W	W	11.57
Railroad ballast	W	W	9.65
Other graded coarse aggregates	16	87	5.44
Total or average	223	2,350	10.52
Fine aggregate (-¾ inch):			
Stone sand, bituminous mix or seal	W	W	8.82
Screening, undesignated	W	W	7.99
Other fine aggregates	2	5	2.50
Total or average	68	549	8.07
Coarse and fine aggregates:			
Graded road base or subbase	267	2,270	8.50
Unpaved road surfacing	136	979	7.20
Crusher run or fill or waste	(2)	(2)	8.54
Other coarse and fine aggregates	394	2,110	5.35
Total or average	797	5,360	6.72
Unspecified:[3]			
Reported	912	5,590	6.12
Estimated	3,100	17,000	5.40
Total or average	3,970	22,100	5.56
Grand total or average	5,110	30,800	6.03

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

VERMONT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	157	$1,130	$7.20
Asphaltic concrete aggregates and road base materials[3]	670	3,330	4.97
Fill	153	467	3.05
Snow and ice control	172	748	4.35
Other miscellaneous uses	28	183	6.54
Unspecified:[4]			
Reported	682	3,780	5.55
Estimated	2,700	12,000	4.26
Total or average	4,520	21,100	4.68

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Reported and estimated production without a breakdown by end use.

TABLE 4b

VERMONT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	221	$1,630	$7.39
Asphaltic concrete aggregates and road base materials	781	4,050	5.19
Fill	228	470	2.06
Snow and ice control	191	822	4.31
Other miscellaneous uses[3]	16	146	9.33
Unspecified:[4]			
Reported	878	4,930	5.61
Estimated	2,600	12,000	4.49
Total or average	4,970	24,000	4.82

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes filtration.
[4]Reported and estimated production without a breakdown by end use.

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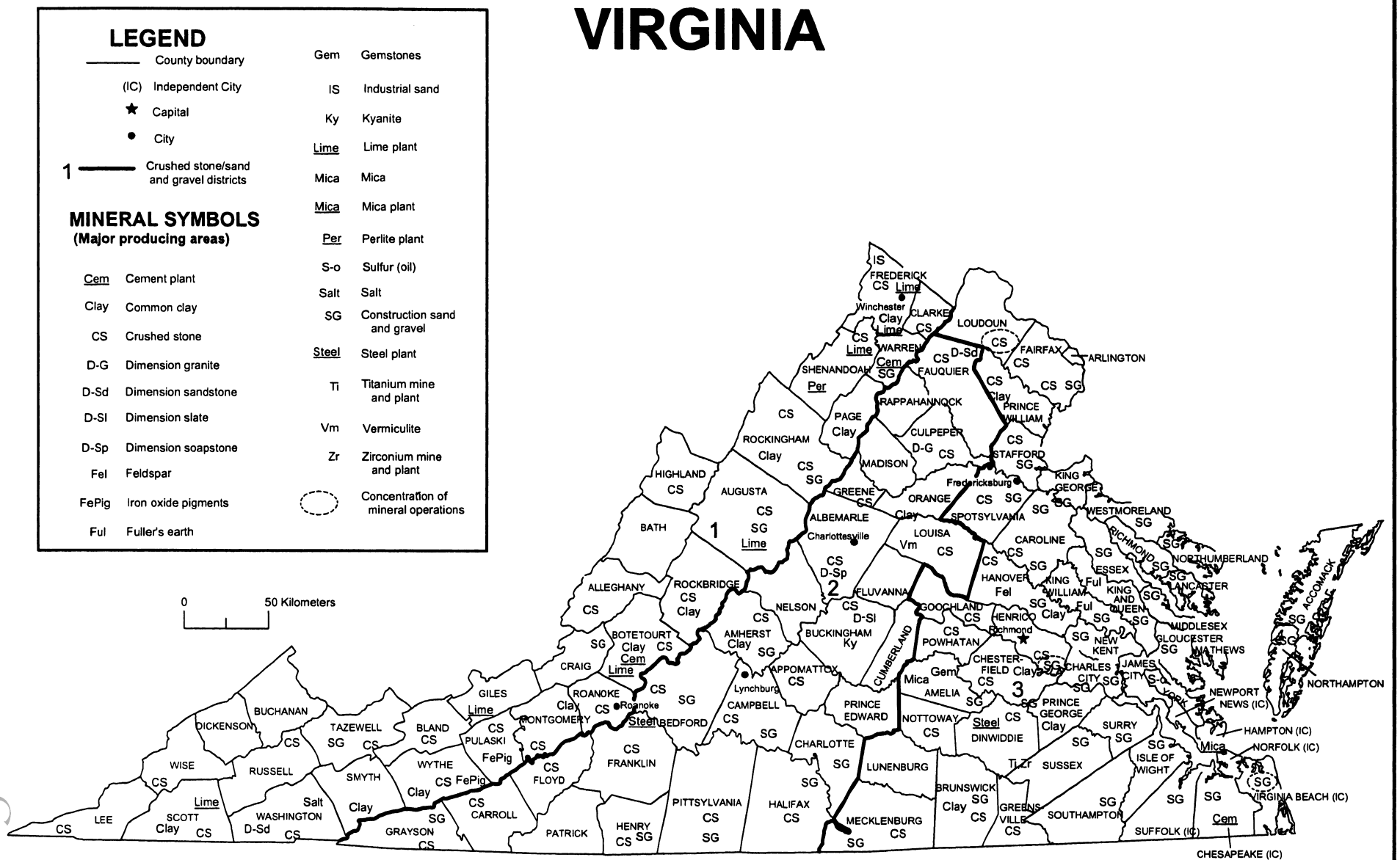
VIRGINIA



Source: Virginia Department of Mines, Minerals and Energy/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Virginia Department of Mines, Minerals and Energy for collecting information on all nonfuel minerals.

In 2004, Virginia's nonfuel raw mineral production was valued[1] at $894 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 14% increase from the State's total nonfuel mineral value for 2003,[2] which was up 13.9% from 2002. Virginia was 19th in rank (18th in 2003) among the 50 States in total nonfuel raw mineral production value and accounted for nearly 2% of the U.S. total value.

Crushed stone was, by value, Virginia's leading raw nonfuel mineral, accounting for about 61% of the State's total nonfuel mineral value. From 1990 through 2004, the State produced nearly 894 million metric tons (Mt) of crushed stone, or an average of nearly 60 million metric tons per year (Mt/yr) during that 15-year period. During the past 5 years, on average, Virginia's quarries have produced about 67 Mt/yr of crushed stone. Cement (masonry and portland) was the second leading nonfuel mineral commodity, followed by construction sand and gravel and lime. These four mineral commodities represented about 85% of the State's total nonfuel mineral value.

In 2004, increases in the production of crushed stone (value up $65 million), zirconium mineral concentrates (zircon), cement, construction sand and gravel (value up $10.3 million), and lime (listed in descending order of change) accounted for most of Virginia's increase in total nonfuel mineral value. Smaller yet significant increases in value also took place in titanium mineral concentrates (ilmenite), common clays, and fuller's earth. The largest decreases in value were those of industrial sand and gravel and crude vermiculite.

In 2003, increases in the values of crushed stone (up $86 million), industrial sand and gravel, and construction sand and gravel (up $5.5 million) accounted for most of the State's increase in value for the year, further supported by smaller yet significant increases in the values of lime, fuller's earth, and ilmenite (descending order of change). These were offset in part by decreases in the values of cement, zirconium concentrates, and common clays. All other changes in value were significantly smaller and inconsequential to the net result (table 1).

In 2004, Virginia continued to be the only State to mine and produce kyanite. It also continued to be: 2d of 2 zirconium-producing States, 2 ilmenite-producing States, and 2 crude vermiculite-producing States; 2d in the quantities of feldspar produced; 4th in fuller's earth and iron oxide pigments; and 10th in lime. The State rose to 7th from 9th in the production of crushed stone, to 10th from 11th in common clays, and was a producer of significant quantities of cement, construction sand and gravel, and industrial sand and gravel (descending order of value). Although the only producing kyanite mine and calcined kyanite (mullite) facilities in the United States were in Virginia, synthetic mullite, which, in USGS terminology is a calcined bauxitic kaolin, was produced in one other State. About 90% of the U.S. kyanite and mullite output was used in refractories for the smelting and processing of a variety of metals and in glass and high-temperature ceramics manufacturing.

The following narrative information was provided by the Virginia Division of Mineral Resources[3] (VDMR) of the Commonwealth of Virginia's Department of Mines, Minerals and Energy (DMME).

Commodity Review

Industrial Minerals

Clay.—Two operators in Virginia produced fuller's earth for cat box litter and industrial absorbents. Bennett Mineral Co., King and Queen County, and Nestlé Purina Petcare, King William County, extracted montmorillonite clay from the Tertiary-age Calvert Formation. Although the combined total of the companies' production was down more than 15% in 2004, the total value rose by about 5%.

Crushed Stone.—Crushed stone production was up in 40 of 52 producing counties in 2004. Total statewide production increased by more than 8% to nearly 73 Mt. Vulcan Construction Materials LP remained the leading producer of crushed stone in the State, reporting a total of 22 Mt in 2004. Vulcan's Manassas Quarry in Prince William County was the single largest producing operation, reporting approximately 3.9 Mt for the year. Loudoun County led the State in crushed stone production, with more than 9 Mt (18% more than 2003). Rockydale Quarries Corp. was making preparations for a 14-hectare (ha) expansion of its crushed stone operation in the City of Roanoke that could extend the life of its quarry by 20 to 40 years and place the company in position to serve the proposed construction of Interstate 73. As part of the expansion, the company will set aside 4 ha for conservation.

Iron Oxide Pigments.—Production of iron oxide pigments remained level from 2003 through 2004. Hoover Color Corp. produced pigments from one pit in residuum over the Shady Dolomite in Pulaski County. One operator resumed production

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

[3]Amy K. Gilmer, Geologist Specialist with the Virginia Division of Mineral Resources, authored the text of the State mineral industry information provided by that State agency.

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in Goochland County, where Minerals and Chemicals Corp. produced ocherous oxides from soil developed on amphibolitic gneiss.

Kyanite.—Kyanite Mining Corp. is currently the only U.S. producer and reportedly the world's largest producer of kyanite and calcined kyanite (mullite). Two pits are operated simultaneously at its Willis Mountain—East Ridge complex in Buckingham County. A portion of the kyanite was trucked 13 kilometers (km) to a separate facility in Dillwyn where it is calcined to produce mullite. The company recently installed a wireless communication system that will link all processing plants with the lab and office. The system allowed real-time centralized monitoring of mining, processing, sales, and shipping activities, as well as pollution-control devices.

Salt.—In Washington County, the Virginia Gas Co. continued to expand the gas storage capacity of an old brine field in Mississippian age evaporite deposits. Salt is extracted from pumped water in an onsite evaporation plant. Salt production was up 15% to about 62,000 metric tons per year.

Vermiculite.—Virginia Vermiculite, LLC in Louisa County is the Nation's second ranking producer of vermiculite. The soft ore is excavated with earth moving equipment and processed onsite. Production was estimated to be about 32,000 t for 2004. A new processing plant, currently under construction, will replace the existing milling, washing, drying, and screening facility in the second half of 2005.

Metals

Gold.—Only one metal mine permit has been active in Virginia in recent years, the Gold Crown Mining Company's Kentuck Mine, a small open pit gold mine in Pittsylvania County. Although exploratory work was carried out, no substantial production has ever been reported. Reclamation of the site by the operator will be completed in early 2005.

Titanium and Zirconium.—In 2004, Virginia was one of three States mining titanium and zircon sands. Iluka Resources Inc.'s Old Hickory Mine, in Dinwiddie County, produced ilmenite and zircon concentrates from Tertiary-age beach sands. Production has increased steadily since a major expansion of the operation in 2002. In 2004, production of the company's heavy-mineral concentrates was 337,000 metric tons (t), an increase of 39% more than 2003.

Government Programs

The VDMR served as the Commonwealth's geological survey. During 2004, the Division continued its geological and mineral resources programs, as well as cooperative programs with Federal agencies in coal research, geologic mapping, and mine safety. With cooperative funding from the USGS's STATEMAP program, geologic mapping and digital map compilation were being focused along the Interstate 81 (I-81) corridor, a nearly 500-km (300-statute mile) highway slated for expansion. The VDMR has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: FEDMAP, which funds Federal geologic mapping projects; STATEMAP, which is a matching-funds grant program with State geological surveys; and EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

New work on the Mineral Resources of Virginia project, a survey of active and abandoned mine sites across the State, was also being focused along I-81. In a major coal mine safety initiative, DMME sought mine maps from coal companies, State and Federal agencies, consultants, and the general public. The maps were being scanned, cataloged in a database, and georeferenced in a Geographic Information System (GIS). This work was supported with a grant from the Mine Safety and Health Administration. Two coal resource studies are also underway, with cooperative funding from the USGS.

Early in 2004, DMR published the Geologic Map of Virginia on CD-ROM. The data files included a detailed raster image of the complete map, vector and polygon files in an industry-standard GIS format, and a searchable version of the expanded explanation, which contains descriptions of every map unit and literature reference. The Division also produced several open file reports, including digital and hard-copy geologic maps along the I-81 corridor and a geostatistical study of coal resources in Buchanan County.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VIRGINIA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	--	--	--	--	5	W
Common	827	3,320	958	2,530	994	4,640
Kyanite[e]	90	13,400	90	13,400	90	13,400
Sand and gravel, construction	10,500	60,000	11,300	65,500	12,800	75,800
Stone:						
Crushed	58,900	395,000	66,500	481,000	72,500	546,000
Dimension	6	651	6	651	5	594
Combine values of cement, clays (fuller's earth), feldspar, gemstones, iron oxide pigments (crude), lime, sand and gravel (industrial), talc (crude), titanium concentrates (ilmenite), vermiculite (crude), zirconium concentrates, and value indicated by symbol W	XX	218,000	XX	223,000	XX	253,000
Total	XX	690,000	XX	786,000	XX	894,000

[e]Estimated. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined value" data. XX not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	46	15,700 r	$91,400 r	$5.84 r	45	18,000	$123,000	$6.84	44	19,100	$137,000	$7.16
Dolomite	7 r	2,640 r	16,000 r	6.07 r	6	3,970	22,600	5.71	6	3,440	19,700	5.73
Marble	--	--	--	--	--	--	--	--	1	286	2,610	9.13
Granite	31 r	24,900 r	180,000 r	7.20 r	26	26,500	201,000	7.59	27	30,200	237,000	7.84
Sandstone and quartzite	5	970	3,750	3.87	5	1,450	10,100	6.97	5	2,040	14,300	7.02
Traprock	10	13,600	96,800	7.14	10	15,900	117,000	7.36	10	16,700	128,000	7.67
Slate	1	W	W	5.62	1	W	W	22.71	1	W	W	22.71
Miscellaneous stone	2 r	W	W	6.36 r	2	W	W	6.38	2	W	W	6.92
Total or average	XX	58,900	395,000	6.70	XX	66,500	481,000	7.23	XX	72,500	546,000	7.54

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$4.92
Riprap and jetty stone	1,390	$14,800	10.65
Filter stone	1,270	10,600	8.29
Other coarse aggregates	1,630	10,000	6.15
Total or average	4,300	35,400	8.24
Coarse aggregate, graded:			
Concrete aggregate, coarse	11,300	91,700	8.08
Bituminous aggregate, coarse	2,800	29,100	10.39
Bituminous surface-treatment aggregate	2,440	20,500	8.42
Railroad ballast	1,310	9,380	7.15
Other graded coarse aggregates	2,260	19,200	8.50
Total or average	20,200	170,000	8.43
Fine aggregate (-¾ inch):			
Stone sand, concrete	824	7,070	8.58
Stone sand, bituminous mix or seal	1,050	9,210	8.78
Screening, undesignated	2,490	14,900	5.99
Other fine aggregate	1,640	11,400	6.95
Total or average	6,010	42,600	7.10
Coarse and fine aggregates:			
Graded road base or subbase	12,600	85,600	6.77
Unpaved road surfacing	1,310	10,400	7.92
Terrazzo and exposed aggregate	(2)	(2)	8.43
Crusher run or fill or waste	2,850	16,700	5.85
Other coarse and fine aggregates	3,420	22,400	6.55
Total or average	20,200	135,000	6.68
Other construction materials	469	1,980	4.21
Agricultural:			
Agricultural limestone	659	4,320	6.55
Poultry grit and mineral food	188	1,990	10.58
Other agricultural uses	52	356	6.85
Total or average	899	6,670	7.42
Chemical and metallurgical:			
Cement manufacture	(3)	(3)	3.31
Lime manufacture	(3)	(3)	6.48
Flux stone	(3)	(3)	8.82
Sulfur oxide removal	(3)	(3)	10.75
Special:			
Mine dusting or acid water treatment	(3)	(3)	6.70
Other fillers and extenders	(3)	(3)	12.03
Other miscellaneous uses:			
Lightweight aggregate (slate)	(3)	(3)	22.71
Abrasives	(3)	(3)	10.96
Other specified uses not listed	266	2,657	9.99
Unspecified:[4]			
Reported	6,780	43,400	6.41
Estimated	5,100	30,000	5.84
Total or average	11,800	73,000	6.17
Grand total or average	66,500	481,000	7.23

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[3]Withheld to avoid disclosing company proprietary data; included in "Total or average."
[4]Reported and estimated production without a breakdown by end use.

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TABLE 3b

VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$4.54
Riprap and jetty stone	1,080	$13,200	12.22
Filter stone	1,320	11,500	8.69
Other coarse aggregates	1,430	9,820	6.85
Total or average	3,840	34,500	9.00
Coarse aggregate, graded:			
Concrete aggregate, coarse	9,620	81,800	8.50
Bituminous aggregate, coarse	2,050	26,800	13.10
Bituminous surface-treatment aggregate	2,690	23,200	8.66
Railroad ballast	1,020	7,620	7.47
Other graded coarse aggregates	2,550	21,700	8.53
Total or average	17,900	161,000	9.00
Fine aggregate (-¾ inch):			
Stone sand, concrete	834	7,700	9.23
Stone sand, bituminous mix or seal	533	4,690	8.80
Screening, undesignated	2,780	17,700	6.36
Other fine aggregate	1,350	8,790	6.53
Total or average	5,490	38,900	7.08
Coarse and fine aggregates:			
Graded road base or subbase	11,100	79,800	7.20
Unpaved road surfacing	1,650	13,500	8.16
Terrazzo and exposed aggregate	(2)	(2)	10.45
Crusher run or fill or waste	1,990	12,300	6.17
Other coarse and fine aggregates	1,970	13,200	6.68
Total or average	16,700	119,000	7.11
Other construction materials	20	78	3.90
Agricultural:			
Agricultural limestone	332	1,850	5.58
Poultry grit and mineral food	(3)	(3)	12.10
Other agricultural uses	405	4,520	11.16
Total or average	737	6,370	8.64
Chemical and metallurgical:			
Cement manufacture	(4)	(4)	3.31
Lime manufacture	(4)	(4)	7.99
Flux stone	(4)	(4)	15.44
Chemical stone	(4)	(4)	11.24
Sulfur oxide removal	(4)	(4)	7.11
Total or average	2,280	11,400	4.99
Special:			
Mine dusting or acid water treatment	(4)	(4)	7.06
Asphalt fillers or extenders	(4)	(4)	12.54
Other fillers and extenders	(4)	(4)	11.63
Total or average	103	1,180	11.45
Other miscellaneous uses and other specified uses not listed	2	312	156.00
Unspecified:[5]			
Reported	18,300	125,000	6.85
Estimated	7,100	48,000	6.79
Total or average	25,400	173,000	6.84
Grand total or average	72,500	546,000	7.54

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[4]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

VIRGINIA : CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	2,220	21,800
Coarse aggregate, graded[3]	3,400	31,200	2,970	25,600	13,700	112,000
Fine aggregate (-⅜ inch)[4]	1,950	14,300	1,200	9,780	2,860	18,600
Coarse and fine aggregate[5]	4,350	26,700	3,670	23,900	12,300	85,100
Other construction materials	198	805	52	320	219	850
Agricultural[6]	785	5,570	W	W	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Special[8]	W	W	--	--	W	W
Other miscellaneous uses[9]	W	W	W	W	W	W
Unspecified:[10]						
Reported	403	2,430	981	6,390	5,390	34,600
Estimated	4,400	26,000	640	4,000	--	--
Total	19,500	128,000	10,300	79,400	36,700	274,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement manufacture, lime manufacture, flux stone, and sulfur oxide removal.

[8]Includes mine dusting or acid water treatment and other fillers or extenders.

[9]Includes lightweight aggregate (slate), abrasives, and other specified uses not listed.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b

VIRGINIA : CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	3,270	33,400	W	W	W	W
Fine aggregate (-⅜ inch)[4]	1,660	11,700	W	W	W	W
Coarse and fine aggregate[5]	2,890	18,100	W	W	W	W
Other construction materials	15	39	5	39	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	2,280	11,400	--	--	--	--
Special[8]	103	1,180	--	--	--	--
Other miscellaneous uses	--	--	(9)	(9)	2	312
Unspecified:[10]						
Reported	1,660	10,000	5,860	43,000	10,700	72,100
Estimated	6,300	40,000	770	8,200	--	--
Total	20,200	139,000	11,600	91,900	40,700	315,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement manufacture, chemical stone, lime manufacture, flux stone, and sulfur oxide removal.

[8]Includes asphalt fillers or extenders, mine dusting or acid water treatment and other fillers or extenders.

[9]Less than ½ unit.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5a
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,420	$33,500	$7.57
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	255	2,060	8.07
Asphaltic concrete aggregates and other bituminous mixtures	1,000	5,440	5.44
Road base and coverings	546	2,790	5.11
Fill	888	2,910	3.28
Other miscellaneous uses[3]	134	784	5.85
Unspecified:[4]			
Reported	1,800	8,100	4.51
Estimated	2,300	9,900	4.30
Total or average	11,300	65,500	5.78

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roofing granules, and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 5b
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	5,540	$43,400	$7.85
Asphaltic concrete aggregates and other bituminous mixtures	855	4,560	5.33
Road base and coverings	420	2,410	5.74
Fill	1,950	5,990	3.08
Snow and ice control	66	387	5.83
Other miscellaneous uses[3]	71	507	7.09
Unspecified:[4]			
Reported	2,010	9,630	4.80
Estimated	1,900	8,900	4.66
Total or average	12,800	75,800	5.92

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6a
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	W	W	4,470	33,700
Asphaltic concrete aggregates and road base materials	W	W	W	W	1,240	5,970
Fill	26	193	47	345	815	2,370
Other miscellaneous uses[3]	486	3,990	61	367	104	567
Unspecified:[4]						
Reported	40	276	9	49	1,750	7,770
Estimated	300	1,300	700	3,600	1,300	4,900
Total	843	5,790	864	4,390	9,630	55,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roofing granules and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6b
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	W	W	5,290	41,200
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	526	2,160
Road base and coverings	--	--	--	--	420	2,410
Fill	2	10	1	5	1,940	5,970
Other miscellaneous uses[3]	433	3,700	153	1,010	121	801
Unspecified:[4]						
Reported	35	249	--	--	1,970	9,380
Estimated	330	1,700	740	3,800	830	3,300
Total	800	5,670	897	4,860	11,100	65,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roofing granules and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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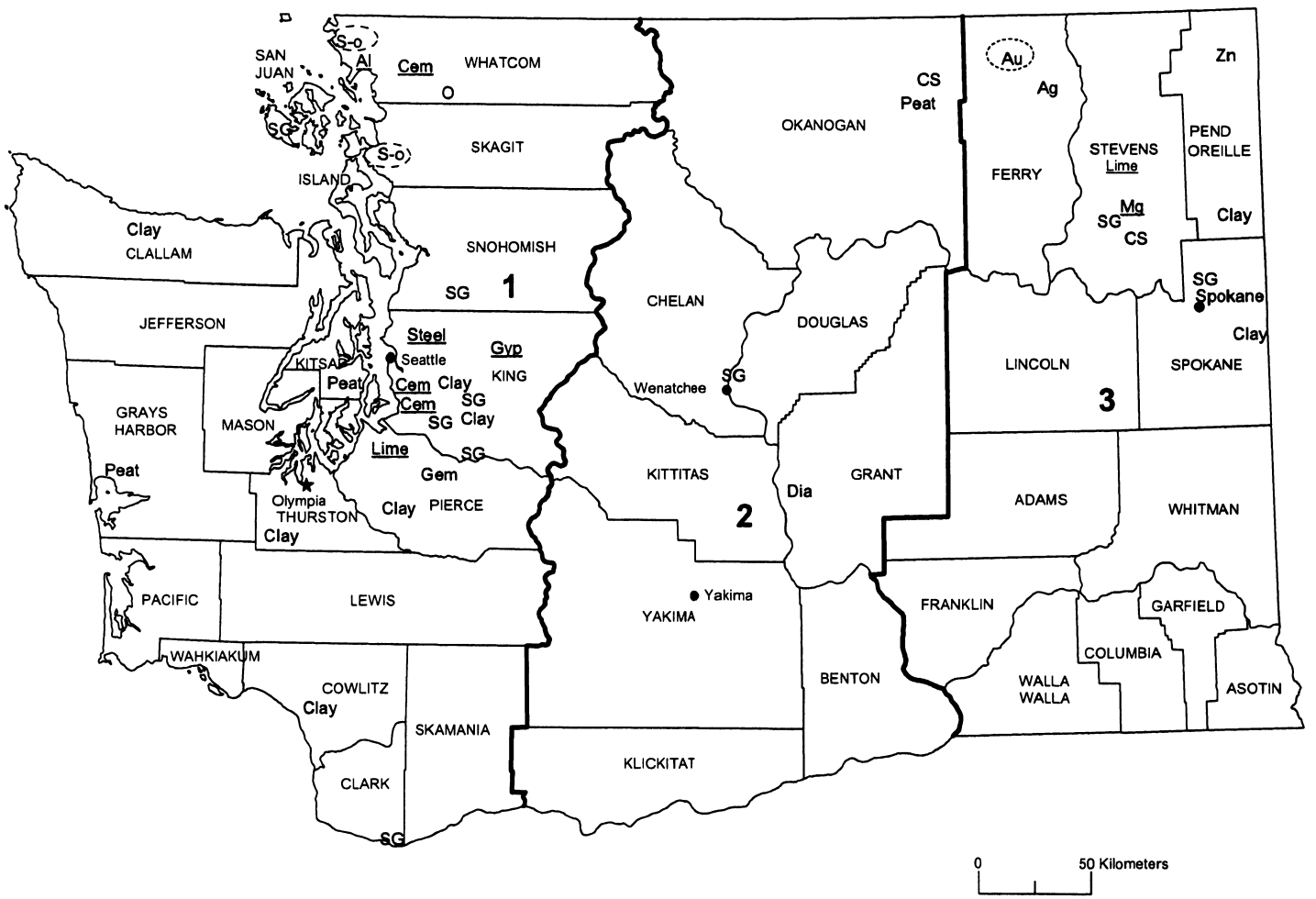
WASHINGTON



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Al	Aluminum plant
Au	Gold
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Dia	Diatomite
Gem	Gemstones
Gyp	Gypsum plant
Lime	Lime plant
Mg	Magnesium metal plant
O	Olivine
Peat	Peat
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
Zn	Zinc
⬭	Concentration of mineral operations

Source: Washington State Division of Geology and Earth Resources/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF WASHINGTON

In 2004, Washington's nonfuel raw mineral production was valued[1] at $507 million, based upon annual U.S. Geological Survey (USGS) data. This was a 28% increase from the State's total nonfuel mineral value for 2003,[2] which was down about 9% from 2002. The State rose to 30th from 33d in rank among the 50 States in total nonfuel mineral production value, of which Washington accounted for more than 1% of the U.S. total value.

In 2004, based upon value, Washington's leading nonfuel mineral commodities were construction sand and gravel, portland cement, crushed stone, gold, and zinc; the two aggregate commodities accounted for nearly 60% of the State's total nonfuel mineral value. Primary metal mine production resumed in the State in 2004 with the reopening of Teck Cominco Limited's Pend Oreille Mine in northeastern Washington and the resumption of mine production at Kinross Gold Corporation's Kettle River Mine. Teck Cominco began commercial zinc and lead production in August, and Kinross Gold produced gold and silver in 2004 following the recommencing of operations at Kettle River in late 2003.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

In 2004, nearly every nonfuel mineral commodity showed increases in production and value. Increases in the values of gold, zinc, portland cement, and construction sand and gravel (up $11 million), in descending order of change, led in the State's increase in total value for the year (table 1). Smaller yet significant increases also took place in the values of lead, lime, and crushed stone (up $2.4 million). The only decrease in production and commodity value was in industrial sand and gravel; the value of gemstones was unchanged.

In 2003, small increases took place in the values of industrial sand and gravel, olivine, and common clays; the value of gemstones rose by 52%. But all other mineral commodities showed decreases in value, the largest decreases of which were in the values of portland cement, gold (down $9.8 million), construction sand and gravel (down $7 million), crushed stone (down $6.2 million), lime, and diatomite (descending order of change) (table 1).

In 2004, Washington continued to be first of 2 olivine-producing States, fourth in the quantities of diatomite produced, fourth in lead, sixth of 10 gold-producing States, and ninth in the production of silver. The State rose to third in the production of zinc in 2004 from no reported production in 2003, and although production of construction sand and gravel increased by 2%, the State decreased in rank to ninth from seventh. Additionally, Washington continued to be a significant producer of portland cement, crushed stone, and industrial sand and gravel. Primary aluminum and raw steel were produced in the State, but both metals were processed from materials acquired from foreign and other domestic sources. In 2004, the State continued to rank 10th in the production of primary aluminum.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2002 Quantity	2002 Value	2003 Quantity	2003 Value	2004 Quantity	2004 Value
Clays, common		89	169	83	204	W	W
Gemstones		NA	29	NA	44	NA	44
Gold[3]	kilograms	980	9,810	--	--	W	W
Sand and gravel, construction		43,200	223,000	40,700	216,000	41,500	227,000
Silver[3]	kilograms	729	108	--	--	W	W
Stone, crushed		13,700	79,900	12,000	73,700	12,300	76,100
Combined values of cement (portland), diatomite, lead (2004), lime, olivine, peat, sand and gravel (industrial), stone [dimension miscellaneous (2004)], zinc (2004), and values indicated by symbol W		XX	124,000	XX	107,000	XX	205,000
Total		XX	437,000	XX	396,000	XX	507,000

NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

TABLE 2
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone[2]	10	1,920	$11,200	$5.82	9	1,690	$10,000	$5.94	18	2,000	$12,700	$6.34
Dolomite	24 r	535 r	2,520 r	4.72	21	205	1,020	4.96	23	201	916	4.56
Marble	2 r	W	W	7.87 r	2	W	W	7.43	2	W	W	7.25
Granite	6	1,040	5,860	5.66	8	925	5,250	5.67	7	862	4,860	5.63
Sandstone	6	296	1,840	6.20	3	344	1,820	5.29	3	303	1,560	5.13
Traprock	81 r	8,970 r	53,200 r	5.93	80	8,050	51,200	6.36	56	8,260	52,600	6.38
Volcanic cinder and scoria	1	W	W	8.22	1	W	W	5.51	1	W	W	5.51
Slate	1	W	W	3.69	1	W	W	6.54	1	W	W	5.79
Miscellaneous stone	11 r	613 r	2,590 r	4.22 r	8	302	1,090	3.61	6	311	1,080	3.49
Total or average	XX	13,700	79,900	5.82	XX	12,000	73,700	6.14	XX	12,300	76,100	6.19

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.14
Riprap and jetty stone	284	$1,920	6.75
Filter stone	5	55	11.00
Other coarse aggregates	29	153	5.28
Total or average	318	2,120	6.68
Coarse aggregate, graded:			
Concrete aggregate, coarse	(2)	(2)	8.82
Bituminous aggregate, coarse	184	1,050	5.70
Bituminous surface-treatment aggregate	227	978	4.31
Railroad ballast	115	586	5.10
Other graded coarse aggregates	179	1,230	6.89
Total or average	705	3,850	5.46
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	5.50
Screening, undesignated	82	312	3.80
Other fine aggregates	40	229	5.73
Total or average	122	541	4.43
Coarse and fine aggregate:			
Graded road base or subbase	792	3,660	4.61
Unpaved road surfacing	383	2,710	7.06
Crusher run or fill or waste	49	240	4.90
Other coarse and fine aggregates	494	2,160	4.38
Total or average	1,720	8,760	5.10
Agricultural:			
Agricultural limestone	(4)	(4)	5.16
Poultry grit and mineral food	(4)	(4)	4.96
Other agricultural uses	(4)	(4)	5.74
Total or average	6	32	5.33
Chemical and metallurgical:			
Flux stone	(5)	(5)	6.92
Glass manufacture	(5)	(5)	4.41
Special:			
Asphalt fillers or extenders	(4)	(4)	9.64
Whiting or whiting substitute	(4)	(4)	5.02
Other fillers or extenders	(4)	(4)	9.02
Total or average	374	3,160	8.44
Unspecified:[6]			
Reported	4,630	32,100	6.93
Estimated	3,800	22,000	5.66
Total or average	8,470	53,800	6.36
Grand total or average	12,000	73,700	6.14

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.14
Riprap and jetty stone	250	$1,810	7.24
Filter stone	W	W	12.13
Total or average	285	2,030	7.13
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	8.29
Bituminous aggregate, coarse	W	W	5.38
Bituminous surface-treatment aggregate	59	437	7.41
Railroad ballast	81	536	6.62
Other graded coarse aggregates	2	20	10.00
Total or average	289	1,930	6.69
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	7.28
Screening, undesignated	W	W	4.93
Other fine aggregates	7	55	7.86
Total or average	32	222	6.94
Coarse and fine aggregate:			
Graded road base or subbase	408	2,110	5.16
Unpaved road surfacing	704	3,320	4.72
Crusher run or fill or waste	W	W	6.62
Roofing granules	W	W	4.43
Other coarse and fine aggregates	328	1,230	3.74
Total or average	1,480	6,940	4.68
Other construction materials	29	129	4.45
Agricultural, limestone	(2)	(2)	5.14
Chemical and metallurgical:			
Cement manufacture	W	W	3.86
Lime manufacture	W	W	13.78
Flux stone	W	W	8.72
Chemical stone	W	W	16.54
Glass manufacture	W	W	4.41
Total or average	365	2,680	7.34
Special, asphalt fillers or extenders	(2)	(2)	8.82
Unspecified:[3]			
Reported	5,290	36,000	6.80
Estimated	4,500	26,000	5.81
Total or average	9,790	62,100	6.34
Grand total or average	12,300	76,100	6.19

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4a

WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	307	2,040	3	33	8	50	--	--
Coarse aggregate, graded[3]	272	1,720	W	W	W	W	231	866
Fine aggregate (-⅜ inch)[4]	W	W	--	--	W	W	--	--
Coarse and fine aggregate[5]	1,370	6,920	102	553	245	1,290	--	--
Agricultural[6]	W	W	W	W	W	W	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W	--	--
Special[8]	W	W	W	W	W	W	--	--
Unspecified:[9]								
Reported	1,710	9,990	1,600	12,300	1,150	8,900	163	864
Estimated	3,400	19,000	360	2,100	100	510	--	--
Total	7,250	41,500	2,390	17,200	1,960	13,300	394	1,730

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes flux stone and glass manufacture.

[8]Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 4b

WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W	W	W	--	--
Other construction materials	28	125	1	4	--	--	--	--
Agricultural[6]	--	--	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	--	--	--	--	W	W	--	--
Unspecified:[9]								
Reported	1,890	11,000	1,740	13,200	1,240	9,530	432	2,290
Estimated	3,900	22,000	530	3,400	100	400	--	--
Total	7,530	43,400	2,320	16,800	2,010	13,600	432	2,290

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, and riprap and jetty stone.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement and lime manufacture, chemical stone, flux stone, and glass manufacture.

[8]Includes asphalt fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5a
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,610	$65,100	$6.77
Plaster and gunite sands	262	1,830	6.97
Concrete products (blocks, bricks, pipe, decorative, etc.)	93	1,220	13.14
Asphaltic concrete aggregates and other bituminous mixtures	1,870	11,300	6.07
Road base and coverings[2]	7,590	39,600	5.22
Fill	5,880	24,900	4.24
Snow and ice control	86	314	3.65
Railroad ballast	166	918	5.53
Other miscellaneous uses	170	1,060	6.22
Unspecified:[3]			
Reported	7,810	35,700	4.57
Estimated	7,200	34,000	4.68
Total or average	40,700	216,000	5.29

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (lime).
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,670	$63,100	$6.52
Plaster and gunite sands	29	252	8.68
Concrete products (blocks, bricks, pipe, decorative, etc.)	2	15	8.82
Asphaltic concrete aggregates and other bituminous mixtures	1,530	10,300	6.70
Road base and coverings	6,720	35,500	5.29
Fill	5,990	25,300	4.22
Snow and ice control	78	307	3.94
Railroad ballast	209	1,230	5.88
Other miscellaneous uses[2]	313	2,520	8.06
Unspecified:[3]			
Reported	7,990	39,400	4.94
Estimated	9,000	49,000	5.42
Total or average	41,500	227,000	5.46

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filtration and roofing granules.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a

WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	8,870	60,800	537	3,080	206	1,190
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	353	3,030	1	5	1	10
Asphaltic concrete aggregates and other bituminous mixtures	1,310	7,310	347	1,460	111	2,180
Road base and coverings[3]	5,600	31,300	1,120	5,020	777	2,970
Fill	5,650	24,200	W	W	W	W
Other miscellaneous uses[4]	302	1,860	162	580	186	577
Unspecified:[5]						
Reported	2,150	10,400	934	4,680	4,710	20,600
Estimated	6,200	28,000	700	3,700	300	1,600
Total	30,400	167,000	3,810	18,500	6,340	29,100

Use	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	98	380
Road base and coverings[3]	84	279
Fill	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	5	8
Estimated	--	--
Total	186	666

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (lime).

[4]Includes railroad ballast and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b

WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	9,110	59,400	519	3,360	42	300
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	29	254	--	--	2	13
Asphaltic concrete aggregates and other bituminous mixtures	1,190	8,920	W	W	W	W
Road base and coverings	4,730	26,200	1,100	5,320	721	3,040
Fill	5,690	24,100	192	638	39	171
Snow and ice control	W	W	W	W	48	122
Other miscellaneous uses[3]	488	3,560	292	1,130	81	381
Unspecified:[4]						
Reported	1,840	10,100	1,740	8,460	4,380	20,700
Estimated	8,000	44,000	460	2,500	560	2,600
Total	31,100	176,000	4,300	21,400	5,880	27,400

Use	Unspecified districts	
	Quantity	Value
Concrete aggregates (including concrete sand)	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings	169	1,030
Fill	67	382
Snow and ice control	--	--
Other miscellaneous uses[3]	32	195
Unspecified:[4]		
Reported	36	194
Estimated	5	8
Total	309	1,810

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration, railroad ballast, and roofing granules.

[4]Reported and estimated production without a breakdown by end use.

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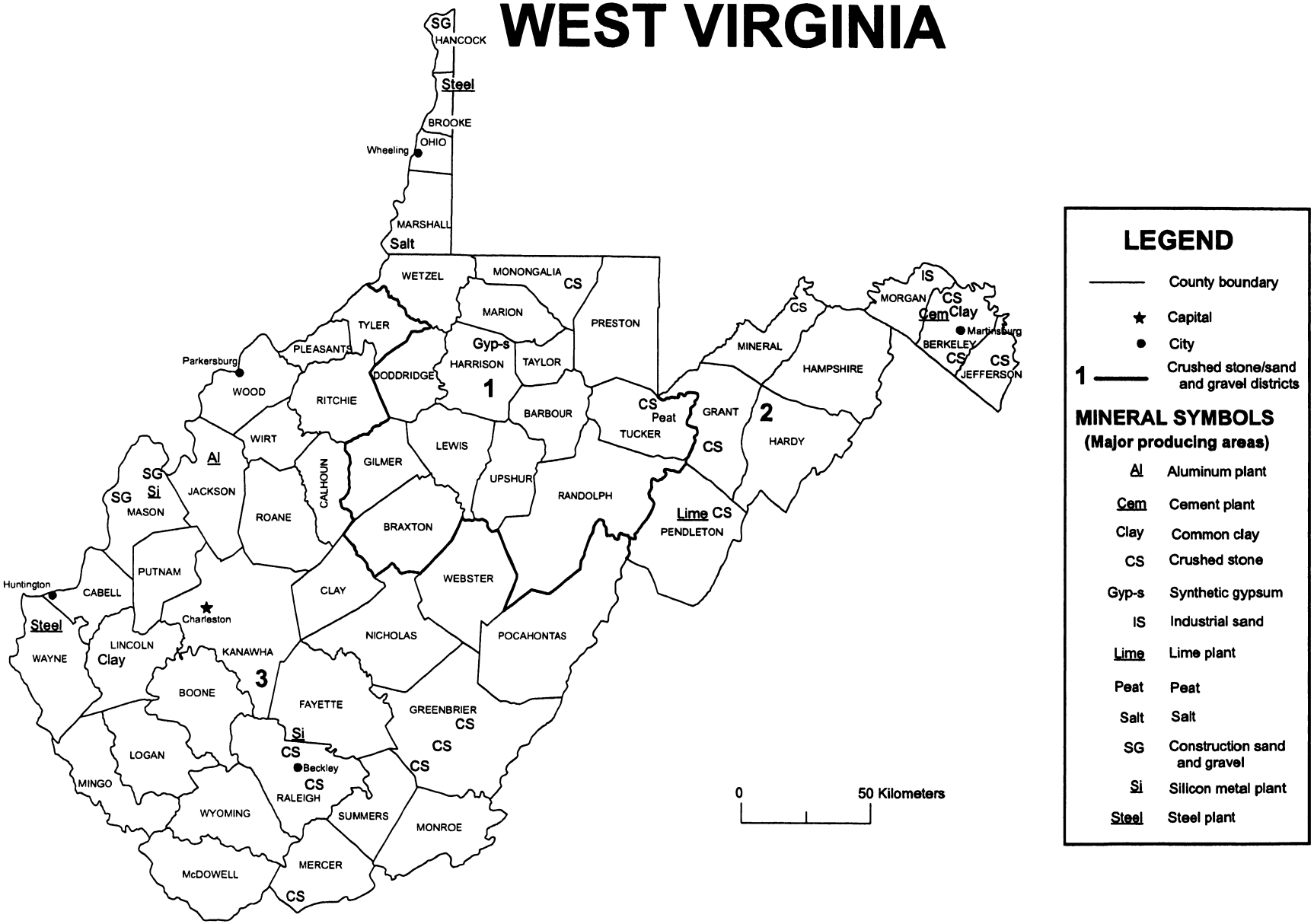
WEST VIRGINIA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Peat	Peat
Salt	Salt
SG	Construction sand and gravel
Si	Silicon metal plant
Steel	Steel plant

Source: West Virginia Geological and Economic Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF WEST VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the West Virginia Geological and Economic Survey for collecting information on all nonfuel minerals.

In 2004, West Virginia's nonfuel raw mineral production was valued[1] at $167 million, based upon annual U.S. Geological Survey (USGS) data. This was a $3 million increase in value from 2003[2], which was down by the same amount from 2002.

In 2004, crushed stone continued to be West Virginia's leading nonfuel mineral by value, representing nearly 44% of the State's total nonfuel mineral production value. Cement (portland and masonry), industrial sand and gravel, lime, and salt followed. These five mineral commodities accounted for about 98% of the State's total nonfuel raw mineral production value. In 2004, production of cement, crushed stone (value up $4 million), and lime (descending order of change in value) increased, offsetting decreases in the production and related values of salt and construction sand and gravel (down $2.3 million) (table 1).

In 2003, increases that took place in the production and values of crushed stone (value up $5.7 million with slightly lowered production), salt, masonry cement, and lime, were slightly more than offset by decreases in the same of portland cement, construction sand and gravel (down $3.7 million) and industrial sand and gravel, resulting in a small net decrease for the year. The State's other nonfuel minerals either showed a small decrease in value or were unchanged (table 1).

West Virginia continued to rank eighth in the quantity of salt produced and remained a significant producer of crushed stone, industrial sand and gravel, and masonry cement. The State's mines produced only industrial minerals and coal; no metals were mined in the State. Primary aluminum and raw steel were produced in the State, but both metals were processed from materials acquired from foreign and other domestic sources. In 2004, West Virginia ranked ninth in the Nation (11th in 2003) in the production of primary aluminum among 12 producing States.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,340	145,000	3,420	148,000	3,510	151,000
Common	33	446	25	55	49	107
Gemstones	NA	12	NA	13	NA	13
Sand and gravel, construction	7,710	32,100	8,290	36,400	10,200	40,100
Stone, crushed	4,450 r	20,500 r	5,020	22,600	7,150	34,500
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, zeolites (2004)	XX	806,000	XX	792,000	XX	819,000
Total	XX	1,000,000 r	XX	999,000	XX	1,040,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
WEST VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone	30	12,200	$51,500	$4.23	29	12,600	$60,200	$4.78	28	13,400	$64,700	$4.84
Sandstone	9	2,230	11,800	5.31	8	1,480	8,900	6.02	8	1,330	8,460	6.38
Total or average	XX	14,400	63,400	4.40	XX	14,100	69,100	4.91	XX	14,700	73,100	4.98

XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3a
WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.28
Riprap and jetty stone	158	$1,170	7.39
Filter stone	W	W	9.82
Other coarse aggregates	55	362	6.58
Total or average	213	1,530	7.19
Coarse aggregate, graded:			
Concrete aggregate, coarse	313	2,060	6.57
Bituminous aggregate, coarse	346	2,210	6.39
Bituminous surface-treatment aggregate	75	477	6.36
Railroad ballast	(2)	(2)	6.28
Other graded coarse aggregates	317	1,710	5.40
Total or average	1,050	6,460	6.15
Fine aggregate (-⅜ inch):			
Stone sand, bituminous mix or seal	(3)	(3)	6.59
Screening, undesignated	216	1,410	6.53
Other fine aggregates	409	2,630	6.43
Total or average	625	4,040	6.47
Coarse and fine aggregate:			
Graded road base or subbase	507	3,270	6.45
Unpaved road surfacing	184	1,110	6.05
Crusher run or fill or waste	976	5,350	5.48
Other coarse and fine aggregates	331	1,720	5.18
Total or average	2,000	11,400	5.73
Other construction materials	15	89	5.93
Agricultural limestone	7	49	7.00
Chemical and metallurgical, lime manufacture	(4)	(4)	2.61
Other miscellaneous uses, waste material	(4)	(4)	3.25
Unspecified:[5]			
Reported	6,560	30,200	4.61
Estimated	3,600	15,000	4.24
Total or average	10,100	45,400	4.48
Grand total or average	14,100	69,100	4.91

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company preprietary data; included with "Other graded coarse aggregates."
[3]Withheld to avoid disclosing company preprietary data; included with "Other fine aggregates."
[4]Withheld to avoid disclosing company preprietary data; included in "Grand total or average."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 3b

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$6.61
Riprap and jetty stone	125	$1,040	8.30
Filter stone	W	W	9.79
Other coarse aggregates	45	210	4.67
Total or average	222	1,430	6.44
Coarse aggregate, graded:			
Concrete aggregate, coarse	138	846	6.13
Bituminous aggregate, coarse	W	W	5.70
Bituminous surface-treatment aggregate	W	W	6.06
Railroad ballast	W	W	6.17
Other graded coarse aggregates	244	1,290	5.29
Total or average	507	2,860	5.64
Fine aggregate (-⅜ inch):			
Stone sand, concrete	W	W	4.83
Stone sand, bituminous mix or seal	W	W	5.84
Screening, undesignated	W	W	6.44
Other fine aggregates	8	60	7.50
Total or average	128	775	6.05
Coarse and fine aggregate:			
Graded road base or subbase	347	2,050	5.91
Unpaved road surfacing	(2)	(2)	10.08
Crusher run or fill or waste	111	682	6.14
Other coarse and fine aggregates	263	1,290	4.90
Total or average	721	4,020	5.58
Agricultural:			
Limestone	(3)	(3)	6.62
Other agricultural uses	1	2	2.00
Special, mine dusting or acid water treatment	(3)	(3)	6.10
Unspecified:[4]			
Reported	10,100	49,700	4.93
Estimated	3,000	14,000	4.65
Total or average	13,100	63,700	4.86
Grand total or average	14,700	73,100	4.98

W Withheld to avoid disclosing company proprietary data; included in "Total or average."

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Withheld to avoid disclosing company preprietary data; included with "Other coarse and fine aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4a

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	177	1,290
Coarse aggregate, graded[3]	W	W	W	W	646	3,810
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	1,410	8,150
Other construction materials	5	28	10	61	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Other miscellaneous uses[8]	--	--	--	--	W	W
Unspecified:[9]						
Reported	3,440	16,500	1,900	8,290	1,220	5,370
Estimated	930	4,800	2,300	8,800	340	1,600
Total	5,130	25,800	4,630	19,700	4,310	23,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), and other fine aggregates.

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes lime manufacture.

[8]Includes waste material.

[9]Reported and estimated production without a breakdown by end use.

TABLE 4b

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	W	W	--	--	W	W
Special[7]	W	W	W	W	--	--
Unspecified:[8]						
Reported	4,220	20,900	2,460	9,860	3,420	19,000
Estimated	910	4,600	1,600	6,700	540	2,700
Total	5,590	28,300	4,580	19,800	4,530	25,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes mine dusting or acid water treatment.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 5a
WEST VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1,2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	W	W	$4.58
Fill	20	$87	4.35
Other miscellaneous uses	760	3,700	4.87
Unspecified:[3]			
Reported	W	W	4.96
Estimated	200	1,000	5.00
Total or average	971	4,750	4.90

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]To avoid disclosing company proprietary data, no district tables were produced in 2003.
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Reported and estimated production without a breakdown by end use.

TABLE 5b
WEST VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY MAJOR USE CATEGORY[1,2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Fill[3]	179	$812	$4.54
Unspecified:[4]			
Reported	251	1,230	4.91
Estimated	94	460	4.91
Total or average	524	2,500	4.78

[1]To avoid disclosing company proprietary data, no district tables were produced in 2004.
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Includes concrete aggregate and concrete products.
[4]Reported and estimated production without a breakdown by end use.

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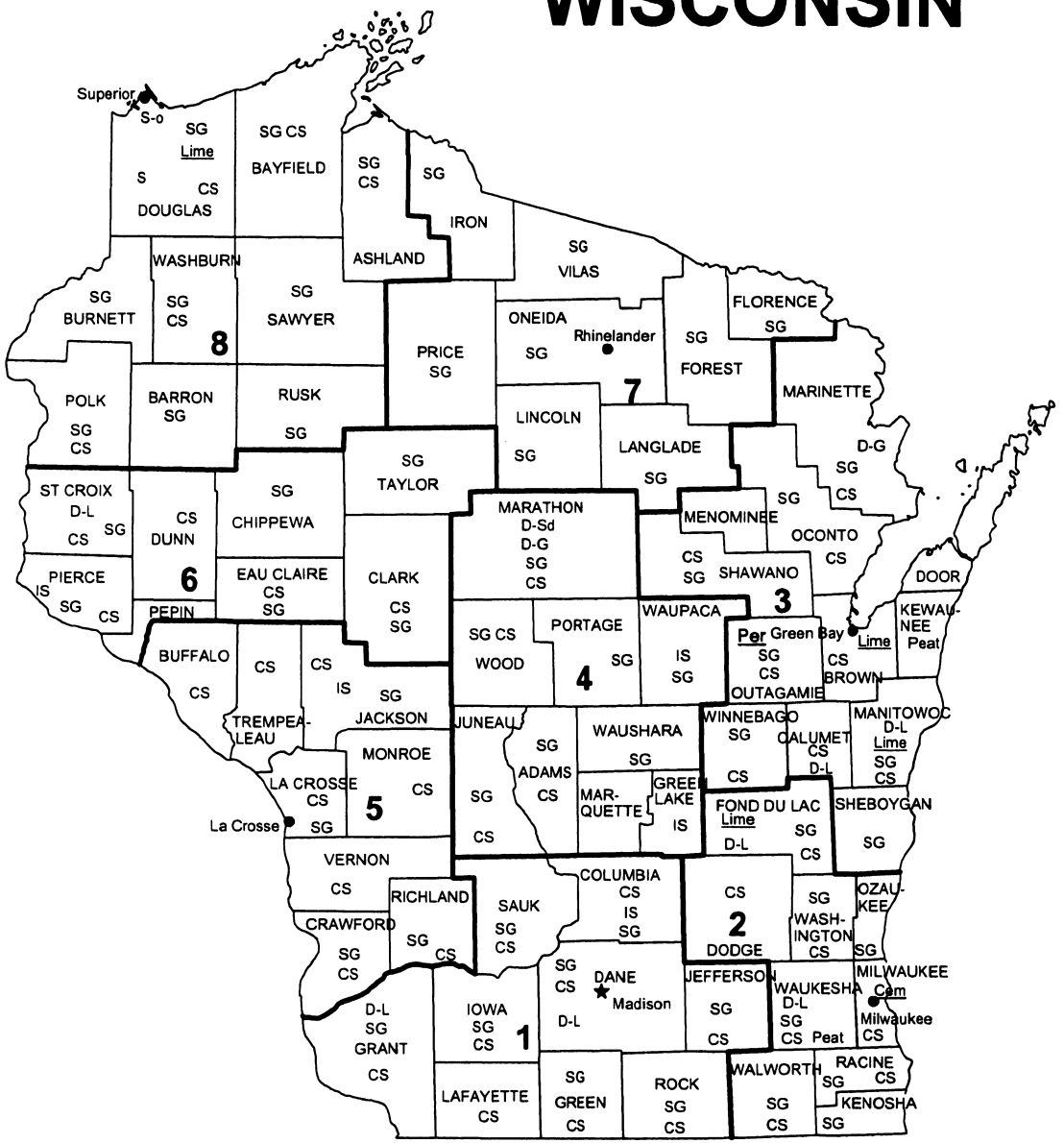

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
CS	Crushed stone
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
IS	Industrial sand
Lime	Lime plant
Peat	Peat
Per	Perlite plant
S	Sulfur (recovered)
S-o	Sulfur (oil)
SG	Construction sand and gravel

0 50 Kilometers

Source: Wisconsin Geological and Natural History Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF WISCONSIN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 2004, Wisconsin's nonfuel raw mineral production was valued[1] at $470 million, based upon annual U.S. Geological Survey (USGS) data. This was a 12.7% increase from the State's total nonfuel mineral value for 2003,[2] which was up 6.4% from 2002. The State ranked 33d (31st in 2003) among the 50 States in total nonfuel mineral production value and accounted for 1% of the U.S. total value. [Because data for peat and portland cement have been withheld (company proprietary data), the actual total values for 2002 to 2004 are higher than those reported in table 1.]

Construction sand and gravel and crushed stone were (in descending order of value) Wisconsin's leading nonfuel minerals in 2004 (a reversal from 2003), accounting for nearly 38% and 35.5%, respectively, of the State's total nonfuel raw mineral production value (table 1). These were followed by lime, representing more than 11% of the total value, industrial sand and gravel, about 10%, and dimension stone, 5% of the total value.

Virtually all the State's mineral commodities rose in production and value in 2004. A nearly 13% increase in construction sand and gravel production resulted in an increase of $28 million in value from 2003 (table 1). Production of lime increased in value by nearly $8 million, crushed stone and industrial sand and gravel increased by about $7 million each, and dimension stone value was up slightly more than $4 million; a significant increase also took place in the production and value of portland cement. The value of peat decreased slightly and gemstones was unchanged.

In 2003, lime with a nearly 26% increase in production led the State's mineral commodities with a $10.4 million increase in value, followed by an increase of $9 million in crushed stone (production down slightly), and $7.5 million rise in industrial sand and gravel value. Portland cement also had a relatively substantial increase in production and value.

In 2004, Wisconsin continued to be ninth in the quantity of lime produced and rose to second from fourth in dimension stone, to third from fourth in industrial sand and gravel, and to seventh from eighth in construction sand and gravel. Also, the State was a significant producer of crushed stone.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey.[3]

Exploration and development

In 2004, many aggregate producers of crushed stone and sand and gravel actively sought new reserves to replace operations that were nearing depletion or that could not be expanded because of nearby residential development. A prime consideration in aggregate exploration in and around major urban areas, such as southeast Wisconsin, has increasingly become whether permits and zoning can be obtained before development makes mining an unacceptable land use.

Wisconsin's nonmetallic mining reclamation law (Department of Natural Resources N.R. 135) provides for registration of operating or undeveloped nonmetallic mineral deposits as a protection from future local zoning changes that would preclude mining. In 2004, there has been significant registration activity in reaction to comprehensive planning, which is being used to discourage or prohibit resource development in some urbanizing areas of the State.

Dimension limestone producers have followed the lead of the aggregate industry in seeking new reserves in less developed regions where permitting was much easier. There has been little exploration activity for high purity limestone or dolomite resources suitable for lime production or for roofing granule materials, but in 2004 industrial sand producers indicated an interest in expanding foundry sand reserves and locating potential hydrofrac sand in anticipation of demand from the petroleum industry.

There has been no significant metallic mineral exploration or leasing activity in Wisconsin for several years. The last exploration drillhole was completed in January 1998.

Commodity Review

Industrial Minerals

The aggregate industry of Wisconsin, which consists of numerous small- to medium-size local or regional (in-state) producers, remained fairly stable during 2004. Mathy Construction Inc. of Onalaska acquired the aggregate operations of American Materials Corporation of Eau Claire in what was probably the most significant aggregate industry acquisition. The former independent Wisconsin Fracsand Inc. of Maiden

[3]Bruce A. Brown, Geologist (nonmetallic minerals), and Thomas J. Evans, Geologist (metallic minerals), both of the Wisconsin Geological and Natural History Survey, coauthored the text of the State mineral industry information provided by that agency.

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Rock in Pierce County, which operated Wisconsin's only underground mining operation, was acquired by Fairmount Minerals.

Wisconsin's nonmetallic mineral industry remained strong in 2004, led by aggregates, dimension stone, and industrial sand. Many aggregate producers, including paving companies and ready-mix concrete producers who operate their own gravel pits and quarries, sought local permits for new sites and expansion of existing operations to meet current demand and ensure future reserves.

Crushed Stone and Dimension Stone.—Dimension limestone production was dominated by flagstone, building stone, and landscape stone quarried from the Silurian rocks of eastern Wisconsin. Several producers have sought to expand operations in the Byron area of Fond du Lac County, and near Chilton in Calumet County since the historically important Sussex-Lannon area of Waukesha County has continued to have a significant degree of residential development. The demand for landscape stone created some interest in the dimension stone potential of the Ordovician Prairie du Chien and Galena-Platteville carbonates of western Wisconsin.

Sandstone for flagstone and facing stone has been produced from silica-cemented beds in the Cambrian rocks of central Wisconsin on a limited scale for many years, but 2004 saw one new quarry and plant opened at Rudolph in Wood County, and renewed interest in exploration for new resources. Wisconsin continued to produce the well known red monument granite from the Wausau area on a limited basis, but hardrock (granite, traprock, and quartzite) was increasingly in demand for riprap, railroad ballast, and specialty aggregates, such as seal coat chips, requiring high durability. Stones for use in landscaping, including glacial boulders, weathered limestone blocks, and washed gravel have become an increasingly lucrative sideline for many aggregate and stone producers.

The lime industry has remained steady, with producers seeking to expand existing quarry operations for lime production and byproducts such as aggregate and riprap. Industrial sand producers report a strong demand for foundry sand and an increased demand for hydrofrac sand for the oil industry. Wisconsin continued to produce a wide variety of industrial sand products from Cambrian, Ordovician, and Quaternary source materials.

Mine Reclamation

Significant progress was made toward implementation of Wisconsin's nonmetallic mining reclamation rules (Department of Natural Resources N.R. 135). These rules, which require reclamation of all new and existing mines operating as of September 1, 2001, granted existing mines an automatic permit until a reclamation plan was prepared and approved. By 2004, most operators had final plans accepted by the county or other administrative authority and financial assurance in place. A workshop sponsored by DNR, the Aggregate Producers of Wisconsin, and Wisconsin Road and Transportation Builders was held in late 2004 to address remaining issues regarding financial assurance and clarify remaining technical issues relating to ground water and highwalls.

Legislation and Government Programs

In 2004, important legislation enacted included ACT 307, which requires municipalities or counties doing comprehensive (Smart Growth) planning to notify mine owners and operators of any action that would affect future mining operations. ACT 308 eliminates the possible requirement of duplicate financial assurance for mine reclamation under N.R. 135. ACT 276 provides for environmental self-audits and exemption from civil penalties for certain violations of permit conditions, and ACT 145 provides for small business regulatory reform, which seeks to evaluate the impact of regulations on small businesses, and provide relief and waivers for self- disclosure.

The aggregate industry has been proactive in development of administrative rules under the Wisconsin Job Creation Act, a law designed to consolidate and streamline the review process for a variety of State issued permits that affect the nonmetallic mining industry. The industry associations have also actively campaigned to reform and expedite the air quality permit process.

By the end of 2004, no proposed legislation related to metallic mining had been passed by the State Legislature. Proposals to modify existing statutes related to metallic mining and ground water, metallic mining and hazardous waste regulation, possible exemptions from administrative rules for metallic mining, and banning the use of cyanide compounds in metallic mineral processing were not enacted.

The need for good public relations has inspired many large and small operators to stage open house events and educational programs for neighbors and K-12 students from local schools. Around the State, large operators sponsor events such as Quarry Quest, Dozer Days, and the Big Dig, which provide family education and entertainment. These events provided demonstrations of quarrying and construction equipment and educational activities relating to geology, environmental issues, and the importance of minerals to society. The largest events are attended by several thousand people and raise thousands of dollars for local charities.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WISCONSIN[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	W	(3)	W	(3)	W	(3)
Gemstones	NA	6	NA	6	NA	6
Lime	603	35,600	757	46,000	850	53,900
Peat	W	(3)	W	(3)	W	(3)
Sand and gravel:						
Construction	39,000	154,000	38,500	150,000	43,400	178,000
Industrial	1,740	32,700	1,930	40,200	2,140	47,000
Stone:						
Crushed	36,200	151,000	35,900	160,000	38,600	167,000
Dimension	100	19,300	101	19,700	232	23,800
Total	XX	392,000	XX	417,000	XX	470,000

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
WISCONSIN: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	136	28,900 r	$121,000 r	$4.17	139	30,200	$135,000	$4.46	157	32,500	$139,000	$4.29
Dolomite	9	2,540 r	10,900 r	4.28 r	12	1,050	4,740	4.50	9	1,100	4,980	4.52
Granite	3 r	1,490 r	6,590 r	4.43 r	4	1,780	8,610	4.83	4	1,820	7,570	4.17
Sandstone and quartzite	5	1,740	6,920	3.97 r	4	1,590	6,630	4.16	3	1,490	6,210	4.17
Traprock	4	1,450	5,800	4.01	4	1,280	5,830	4.56	5	1,780	9,030	5.06
Total or average	XX	36,200	151,000	4.17	XX	35,900	160,000	4.47	XX	38,600	167,000	4.32

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3a

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$4.70
Riprap and jetty stone	124	$770	6.24
Filter stone	142	728	5.13
Other coarse aggregates	1,250	6,070	4.85
Total or average	1,520	7,570	4.98
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,510	8,490	5.62
Bituminous aggregate, coarse	298	1,600	5.37
Bituminous surface-treatment aggregate	251	1,240	4.95
Railroad ballast	(2)	(2)	4.41
Other graded coarse aggregates	11	49	4.45
Total or average	2,070	11,400	5.50
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(3)	(3)	8.78
Stone sand, bituminous mix or seal	(3)	(3)	7.38
Screening, undesignated	802	3,630	4.53
Other fine aggregates	1,000	4,070	4.06
Total or average	1,810	7,700	4.26
Coarse and fine aggregate:			
Graded road base or subbase	5,460	29,600	5.42
Unpaved road surfacing	252	853	3.38
Terrazzo and exposed aggregate	(4)	(4)	4.96
Crusher run or fill or waste	286	1,090	3.80
Roofing granules	(4)	(4)	6.87
Other coarse and fine aggregates	1,860	13,100	7.04
Total or average	7,860	44,600	5.68
Other construction materials	33	155	4.70
Agricultural:			
Agricultural limestone	300	2,710	9.04
Other agricultural uses	17	65	3.82
Total or average	317	2,780	8.76
Chemical and metallurgical, lime manufacture	(5)	(5)	4.91
Unspecified:[6]			
Reported	993	4,670	4.68
Estimated	21,000	82,000	3.83
Total or average	22,300	86,200	3.86
Grand total or average	35,900	160,000	4.47

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Withheld to avoid disclosing company proprietary data, included in "Unspecified: Reported."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 3b

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$5.37
Riprap and jetty stone	298	$2,050	6.88
Filter stone	123	658	5.35
Other coarse aggregates	462	2,470	5.34
Total or average	883	5,170	5.86
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,660	9,720	5.86
Bituminous aggregate, coarse	239	1,300	5.42
Bituminous surface-treatment aggregate	316	1,690	5.36
Railroad ballast	11	75	6.82
Other graded coarse aggregates	62	364	5.87
Total or average	2,290	13,100	5.75
Fine aggregate (-⅜ inch):			
Stone sand, concrete	(2)	(2)	6.14
Stone sand, bituminous mix or seal	(2)	(2)	5.71
Screening, undesignated	865	3,900	4.51
Other fine aggregates	39	160	4.10
Total or average	905	4,070	4.50
Coarse and fine aggregates:			
Graded road base or subbase	5,550	30,300	5.47
Unpaved road surfacing	304	980	3.22
Crusher run or fill or waste	609	5,630	9.25
Roofing granules	(3)	(3)	6.94
Other coarse and fine aggregates	1,120	5,710	5.08
Total or average	7,580	42,700	5.63
Agricultural:			
Agricultural limestone	324	3,190	9.85
Other agricultural uses	14	54	3.86
Total or average	338	3,250	9.60
Chemical and metallurgical, cement manufacture	(4)	(4)	3.00
Other miscellaneous uses:			
Refractory stone	(4)	(4)	1.37
Other specified uses not listed	(4)	(4)	4.80
Unspecified:[5]			
Reported	1,900	7,690	4.04
Estimated	24,000	88,000	3.68
Total or average	25,800	95,700	3.71
Grand total or average	38,600	167,000	4.32

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total or average."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4a

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	W	W	W	W	W	W	W	W
Coarse aggregate, graded[4]	W	W	W	W	528	2,570	W	W
Fine aggregate (-⅜ inch)[5]	106	310	W	W	W	W	W	W
Coarse and fine aggregate[6]	W	W	1,720	11,000	W	W	793	2,850
Other construction materials	--	--	--	--	24	110	9	45
Agricultural[7]	112	568	W	W	W	W	--	--
Chemical and metallurgical[8]	--	--	--	--	(9)	(9)	--	--
Unspecified:[10]								
Reported	657	2,740	65	263	246	1,180	31	479
Estimated	1,700	7,000	3,400	13,000	2,300	6,200	570	2,300
Total	5,590	29,500	7,490	37,200	6,040	25,100	2,460	10,100

Use	District 5		District 6		District 8		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	--	--	W	W	20	141	75	332
Coarse aggregate, graded[4]	--	--	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[5]	--	--	--	--	W	W	115	617
Coarse and fine aggregate[6]	--	--	W	W	262	1,330	341	1,520
Other construction materials	--	--	--	--	--	--	--	--
Agricultural[7]	--	--	--	--	W	W	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--	--	--
Unspecified:[10]								
Reported	--	--	--	--	--	--	--	--
Estimated	10,000	40,000	2,400	9,600	970	4,300	--	--
Total	10,000	40,000	2,470	10,000	1,380	6,450	531	2,470

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]No crushed stone was produced in District 7.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6]Includes crusher run (select material or fill), graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone and other agricultural uses.

[8]Includes lime manufacture.

[9]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[10]Reported and estimated production without a breakdown by end use.

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TABLE 4b

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	W	W	714	4,230	252	1,230	--	--
Coarse aggregate, graded[4]	461	2,510	W	W	617	3,200	--	--
Fine aggregate (-⅜ inch)[5]	W	W	W	W	518	2,110	--	--
Coarse and fine aggregate[6]	W	W	W	W	1,980	10,000	(7)	(7)
Agricultural[8]	W	W	W	W	W	W	--	--
Chemical and metallurgical[9]	--	--	--	--	W	W	--	--
Other miscellaneous uses[10]	--	--	--	--	W	W	--	--
Unspecified:[11]								
Reported	567	2,340	--	--	--	--	1,670	6,820
Estimated	2,200	8,900	3,500	13,000	5,000	13,000	840	3,400
Total	6,200	32,600	7,750	38,600	8,670	30,300	2,510	10,200

Use	District 5		District 6		District 8		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	--	--	W	W	W	W	115	523
Coarse aggregate, graded[4]	--	--	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[5]	--	--	--	--	--	--	149	773
Coarse and fine aggregate[6]	--	--	W	W	W	W	433	1,910
Agricultural[8]	--	--	--	--	--	--	--	--
Chemical and metallurgical[9]	--	--	--	--	--	--	--	--
Other miscellaneous uses[10]	--	--	W	W	--	--	--	--
Unspecified:[11]								
Reported	--	--	--	--	--	--	--	--
Estimated	7,700	30,000	3,200	12,000	1,300	6,400	--	--
Total	7,700	30,000	3,590	14,600	1,510	7,090	697	3,210

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]No crushed stone was produced in District 7.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[7]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[8]Includes agricultural limestone and other agricultural uses.

[9]Includes cement manufacture.

[10]Includes refractory stone and other specified uses not listed.

[11]Reported and estimated production without a breakdown by end use.

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TABLE 5a
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,420	$29,500	$4.60
Plaster and gunite sands	29	158	5.45
Concrete products (blocks, bricks, pipe, decorative, etc.)	305	1,070	3.51
Asphaltic concrete aggregates and other bituminous mixtures	1,970	7,950	4.04
Road base and coverings	3,750	12,200	3.25
Road and other stabilization (lime)	196	883	4.51
Fill	2,010	5,660	2.82
Snow and ice control	100	393	3.93
Roofing granules	9	55	6.11
Filtration	33	184	5.58
Other miscellaneous uses	140	1,180	8.45
Unspecified:[2]			
Reported	7,760	29,300	3.77
Estimated	16,000	62,000	3.92
Total or average	38,500	150,000	3.91

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 5b
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,630	$25,100	$4.46
Plaster and gunite sands	24	178	7.47
Concrete products (blocks, bricks, pipe, decorative, etc.)	242	1,160	4.78
Asphaltic concrete aggregates and other bituminous mixtures	2,670	14,100	5.29
Road base and coverings	7,250	26,900	3.71
Road and other stabilization (cement and lime)	491	2,720	5.54
Fill	1,560	4,830	3.10
Snow and ice control	251	1,040	4.16
Filtration	40	232	5.81
Other miscellaneous uses[2]	102	504	4.93
Unspecified:[3]			
Reported	4,160	17,600	4.23
Estimated	21,000	84,000	4.01
Total or average	43,400	178,000	4.11

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes roofing granules.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6a
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,240	5,890	2,080	9,150	1,180	5,390
Asphaltic concrete aggregates and road base materials[3]	493	2,080	1,140	5,060	1,420	4,690
Fill	101	462	742	2,630	336	767
Snow and ice control	14	45	5	54	37	131
Roofing granules	9	55	--	--	--	--
Other miscellaneous uses[4]	44	220	11	71	23	82
Unspecified:[5]						
Reported	1,230	5,140	5,430	21,000	70	280
Estimated	300	1,300	3,200	13,000	1,400	5,200
Total	3,460	15,200	12,600	50,800	4,430	16,500

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	276	1,230	W	W	790	2,710
Asphaltic concrete aggregates and road base materials[3]	W	W	W	W	430	2,140
Fill	111	421	W	W	219	538
Snow and ice control	5	15	--	--	24	58
Roofing granules	--	--	--	--	--	--
Other miscellaneous uses[4]	236	1,040	183	705	15	68
Unspecified:[5]						
Reported	933	2,700	--	--	5	9
Estimated	4,100	16,000	1,200	4,600	2,600	11,000
Total	5,630	21,300	1,350	5,290	4,100	16,500

	District 7		District 8		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	515	3,220	563	2,770
Asphaltic concrete aggregates and road base materials[3]	211	562	1,660	4,270	266	1,200
Fill	W	W	113	189	286	315
Snow and ice control	8	28	8	61	--	--
Roofing granules	--	--	--	--	--	--
Other miscellaneous uses[4]	132	686	24	191	8	85
Unspecified:[5]						
Reported	23	55	64	107	--	--
Estimated	1,700	6,200	1,000	3,500	400	1,600
Total	2,040	7,510	3,310	11,500	1,540	5,990

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Includes filtration.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	1,170	6,110	2,330	10,600	1,160	5,070
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	169	713	14	83
Asphaltic concrete aggregates and other bituminous mixtures	W	W	1,840	10,900	201	750
Road base and coverings[4]	W	W	4,500	20,900	1,130	3,810
Fill	143	546	764	2,690	322	695
Snow and ice control	W	W	9	150	102	403
Other miscellaneous uses[5]	356	1,290	1	14	20	118
Unspecified:[6]						
Reported	319	1,890	2,310	9,250	114	492
Estimated	1,600	6,400	3,600	15,000	1,500	6,000
Total	3,580	16,200	15,500	69,700	4,580	17,400

	District 4		Districts 5 and 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	165	654	W	W	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	183	781	W	W
Road base and coverings[4]	W	W	589	1,360	301	855
Fill	58	239	160	420	18	43
Snow and ice control	--	--	59	151	W	W
Other miscellaneous uses[5]	168	897	591	1,920	70	274
Unspecified:[6]						
Reported	813	2,550	476	2,390	6	226
Estimated	4,700	19,000	4,300	18,000	1,600	6,100
Total	5,950	23,300	6,360	24,700	2,000	7,460

	District 8		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	194	714	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	--	--	--	--
Asphaltic concrete aggregates and other bituminous mixtures	272	979	--	--
Road base and coverings[4]	1,040	2,370	--	--
Fill	95	197	--	--
Snow and ice control	58	219	--	--
Other miscellaneous uses[5]	10	17	--	--
Unspecified:[6]				
Reported	120	807	--	--
Estimated	2,500	10,000	1,100	4,200
Total	4,290	15,400	1,100	4,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 5 and 6 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (cement and lime).
[5]Includes filtration and roofing granules.
[6]Reported and estimated production without a breakdown by end use.

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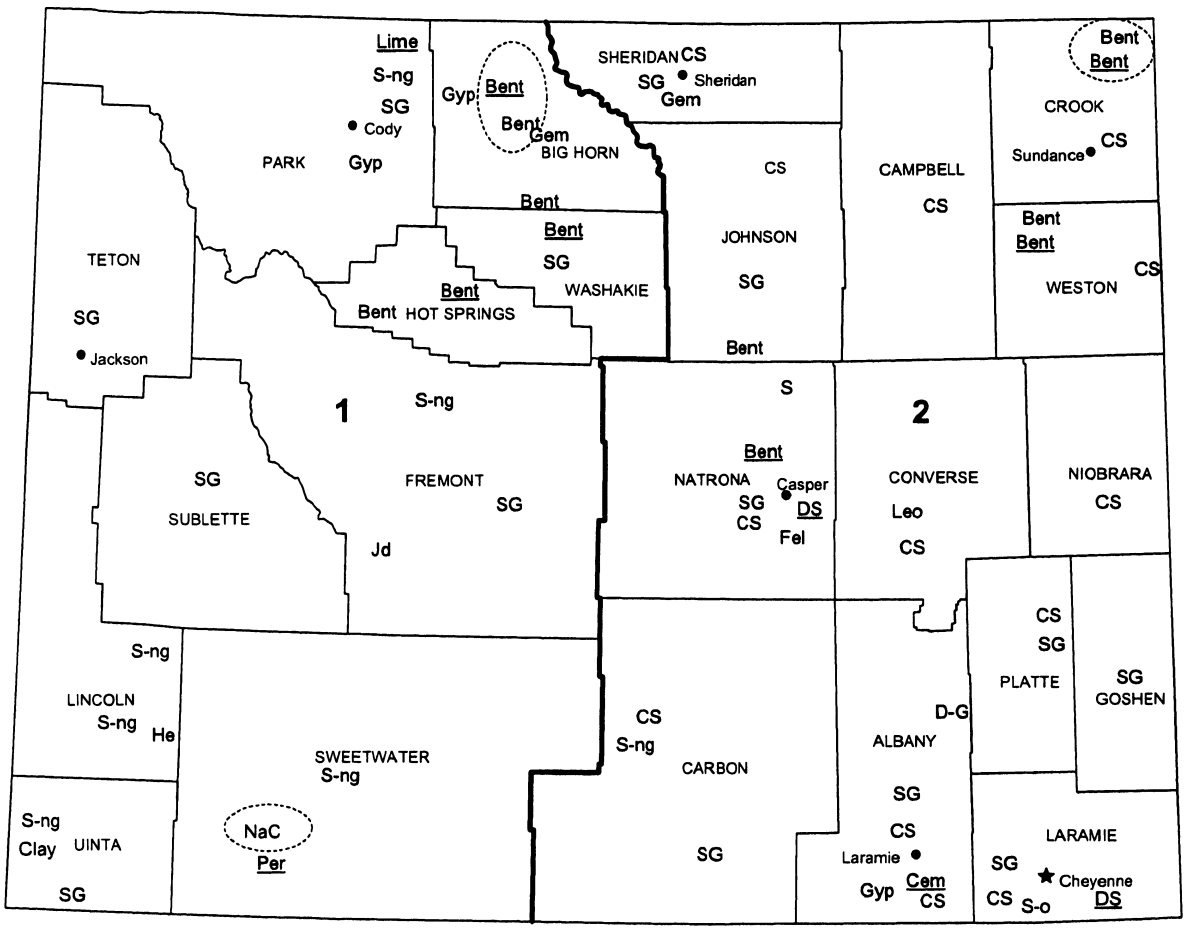
WYOMING



MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Bent	Bentonite plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
DS	Dimension stone plant
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
He	Helium
Jd	Jade
Leo	Leonardite
Lime	Lime plant
NaC	Sodium carbonate
Per	Perlite plant
S	Sulfur
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel
	Concentration of mineral operations

LEGEND

- County boundary
- ★ Capital
- • City
- 1 — Crushed stone/sand and gravel districts

0 100 Kilometers

Source: Wyoming State Geological Survey/U.S. Geological Survey (2004)

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THE MINERAL INDUSTRY OF WYOMING

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wyoming State Geological Survey, for collecting information on all nonfuel minerals.

In 2004, Wyoming's nonfuel raw mineral production was valued[1] at $1.04 billion, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 4% increase from the State's total nonfuel mineral value for 2003[2], which was down marginally from 2002. The State was 16th in rank (15th in 2003) among the 50 States in total nonfuel raw mineral production value and accounted for about 2.3% of the U.S. total value.

Soda ash was Wyoming's leading nonfuel mineral, by value, followed by bentonite, Grade-A helium, and portland cement. Together, the four accounted for nearly 93% of the State's total nonfuel raw mineral production value. In 2004, with increases in the production of each commodity, increases in the values of soda ash, crushed stone (up $11.9 million), Grade-A helium, portland cement, construction sand and gravel (up $3.7 million), and bentonite (up $3 million) (in descending order of change), offset somewhat by decreases in the values of gypsum and lime, led to the State's increase in total nonfuel mineral value.

In 2003, increases in the values of bentonite, construction sand and gravel, crushed stone, Grade-A helium, and gypsum were slightly less than decreases in the values of soda ash, portland cement, and common clays (decreases in descending order of change), resulting in the slight net decrease in total nonfuel raw mineral production value from 2002.

In 2004, Wyoming continued to be first in rank in the quantities of soda ash and bentonite clay produced, and second in Grade-A helium production. With the resumption of production, the State was sixth in zeolite among seven producing States. Wyoming also continued to be a producer of significant quantities of construction sand and gravel. Gypsum production showed a significant decrease, the State dropping in rank to 12th from 9th. Soda ash (sodium carbonate), which is produced mainly from trona ore, is an inorganic chemical that is used extensively in the manufacture of glass, paper, soap and detergents, and textiles, and, in the form of sodium bicarbonate, in food products. The United States is the world's second largest producer of soda ash. Wyoming was one of only three soda ash-producing States and is home to the world's largest known deposit of trona. California and Colorado produce significantly smaller quantities of natural soda ash.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

The Wyoming State Geological Survey (WSGS) provided the following narrative information.[3] Production data in the text that follows are those reported by the WSGS and are based on the agency's own surveys and estimates. They may differ from production figures reported to the USGS.

Exploration and Development Activities

Industrial Minerals

Diamond.—Several companies expressed interest in diamond exploration in Wyoming during 2004, but exploration activity remained limited. One company recovered diamonds from two separate bulk samples of a Tertiary breccia pipe southwest of Green River.

The potential for diamonds is great in the part of the western United States underlain by Archean rocks (older than approximately 2.7 billion years), collectively known as the Wyoming Province. These rocks exist beneath much of Wyoming, Montana, eastern Idaho, northern Utah, the northern edge of Colorado, and the western edges of South Dakota and North Dakota. Within this region, and extending south into Colorado beyond the Wyoming Province boundary, diamonds have been found in many kimberlites and related host rocks. A Colorado diamond mine along the Wyoming-Colorado border (State Line District) operated between 1996 and 2003. Since the discovery of diamonds in the State Line District in 1975, more than 130,000 diamonds have been produced there, including several very large gemstones. Lack of access to diamondiferous and potentially diamondiferous kimberlites coupled with individual company policies has limited development in the area.

Every kimberlite in the State Line District has yielded diamonds, and approximately one-half of the diamonds recovered in Wyoming have been gem quality. One kimberlite produced gemstones weighing up to 28.3 carats (including a diamond fragment from an estimated 90-carat diamond), and another kimberlite yielded diamond ore grades as high as 135 carats per 100 metric tons (t) of rock. There are at least two commercial diamond deposits in Australia that yield grades of only 15 carats per 1,000 t of rock and diamonds not much larger than those found in the State Line District. Nearly a dozen kimberlites in this district have not been tested; a group of geophysical anomalies (interpreted to be buried diamond pipes) lies within the middle of the diamond pipes in Wyoming. These anomalies have never been drilled.

Diamond-bearing intrusives also occur in the Laramie Range in the Iron Mountain District, northwest of Cheyenne, and in the Cedar Mountain area southwest of Rock Springs. The potential

[3]Wayne M. Sutherland, Assistant Staff Geologist; Bob Gregory, Geological Analyst; and W. Dan Hausel, Senior Economic Geologist; Natural Resources Division, Wyoming State Geological Survey, coauthored the text of the State mineral industry information.

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for other in-place diamond discoveries in Wyoming is very great.

Gemstones.—The collection and marketing of small quantities of precious gemstones, semiprecious gemstones, and unique geologic materials from Wyoming is not tracked. The sale of these materials during 2004 by amateur collectors, prospectors, semiprofessionals, and professional dealers took place primarily at gem and mineral shows, in local jewelry and rock shops, and over the Internet. These mineral commodities include various agates, iolite, jade, jasper, Kimberlite, kyanite, labradorite. lamproite, nephrite, opal, quartz, ruby, sapphire, and satin spar, and other types of rock specimens are also sold.

Eagle-Hawk Mining (a Colorado company) continued to work on the Palmer Canyon gem-quality iolite (cordierite)-sapphire-ruby-kyanite occurrence in the Laramie Range west of Wheatland. Recent trenching in this deposit exposed an estimated 100,000+ carats of potential gem-quality cordierite in approximately 1 cubic yard of material.

In 2004, the WSGS identified a similar significant gemstone deposit at Grizzly Creek, south of Palmer Canyon in the central Laramie Range. The Grizzly Creek discovery hosts extraordinary sky-blue transparent to translucent kyanite specimens up to about 10 centimeters (4 inches) long that are associated with quartzofeldspathic gneiss and pelitic schist. Ruby and sapphire are less common here than at Palmer Canyon. However, iolite was found in masses estimated to weigh 5,000 carats or more. Although fracturing is common, much of the material appears suitable for gemstones. The Grizzly Creek deposit is described in WSGS Open File Report 04-14.

Following a tip from a local prospector, the WSGS investigated an opal deposit in the Cedar Rim area of central Wyoming. As much as 30 meters thick in some areas, the deposit includes occurrences spread over parts of 11 sections. The White River Formation is the primary host rock unit, but mineralization occurs locally in the underlying Wagon Bed Formation. Individual specimens weighing more than 11 kilograms (kg) were recovered. Collected opal included milky-white, transparent, yellow, green, brown, gray, mottled, black, and opal breccia. Several specimens exhibited traces of play-of-color that suggest possible precious opal occurrence.

Metals

Since 2001, rising metal prices have led to increased metals exploration in Wyoming. In 2004, metals exploration activity included searches for gold and platinum-group metals. However, no significant metals production has taken place since iron ore mining ended at South Pass in 1984.

Gold.—The Dickie Springs-Oregon Gulch paleoplacer is possibly the largest undeveloped gold occurrence in North America. Here, the Cathedral Bluffs Tongue of the Eocene Wasatch Formation may host more than 886,000 kg of placer gold worth more than $12 billion in 2005. Fremont Gold Corp. (a Canadian company) planned to explore this massive paleoplacer, and proposed up to 200 exploration pits or trenches over an area of approximately 2,070 hectares (ha) with a total surface disturbance of less than 0.4 ha. In addition, a small locally owned mine operating in the same area during the summer and fall produced enough gold to justify continued operations. Gold exploration by Bald Mountain Mining Company continued in the Rattlesnake Hills during 2004. Minor gold activity also took place in the Sierra Madre and the Black Hills.

Platinum-Group Metals.—Minor exploration activity for platinum-group metals continued in the Medicine Bow Mountains and the Sierra Madre. Layered mafic-ultramafic intrusives, ultramafic massifs, and fragments host chromium, copper, gold, palladium, platinum, silver, titanium, and vanadium anomalies within the Proterozoic terrain. The Mullen Creek, Lake Owen, and Puzzler Hill complexes are most notable. The New Rambler Mine, one of the only known historical platinum-palladium mines in North America, is located in the Mullen Creek mafic-ultramafic complex in the Medicine Bow Mountains.

Titanium.—Wyomex Resources Inc. investigated the titanium-bearing sandstone in the Cretaceous Mesaverde Formation in the Bighorn Basin and recovered samples consisting of 11% TiO_2 and 1% ZrO_2. Minerals of interest included ilmenite, leucoxene, magnetite, rutile, and zircon, as well as, a small amount of native gold.

Commodity Review

Industrial Minerals

Overall production of nonfuel minerals in Wyoming was greater in 2004 than in 2003. Production of bentonite, gypsum, limestone, sand and gravel, and trona all increased slightly to moderately, while production of decorative stone, granite ballast, and siliceous shale decreased. Interest in developing silica sand deposits in the Cassa and Plumbago Canyon areas of southeast Wyoming has remained steady, as has interest in further development of gypsum deposits in north-central Wyoming and bentonite deposits in south-central Wyoming.

Bentonite.—According to the Office of the State Inspector of Mines, Wyoming produced 39% more bentonite in 2004 than in 2003. In Big Horn, Crook, Johnson, Washakie, and Natrona Counties (listed in order of decreasing total production) 10 mines supplied 13 mills with bentonite.

Dimension Stone.—The dimension stone quarry currently operating near Rawlins produces sandstone marketed under the name Wyoming Gray Sandstone. This product is processed in Cheyenne along with rock types from sources including Platte County quarries no longer in operation.

Gypsum.—Three quarries produced gypsum in 2004: two in the Bighorn Basin (Big Horn and Park Counties) produced gypsum for wallboard, and one smaller quarry in Albany County produced gypsum for use as a setting retardant in cement.

Limestone.—Limestone is quarried in Wyoming primarily for use in highway construction (as crushed stone for aggregate and as surface material). Chemical-grade Wyoming limestone (limestone consisting of more than 95% $CaCO_3$) is used to produce lime, a substance necessary for cement manufacturing, sugar beet refining, and other industrial processes (Harris, 2004, p. 29-32).

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Silica.—Although no new silica sand deposits have been developed since 2003, interest in deposits at the Cassa (Platte County) and Plumbago Creek (Albany County) locations has continued. Silica sand is the primary ingredient in the manufacture of glass, and is also incorporated in hydrofrac sand used to enhance the recoverability of oil and natural gas. Silica deposits of high quality for glass manufacture are scarce west of the Mississippi, and the above-mentioned deposits may prove suitable (Harris, 1988a, p. 24; Harris, 1988b, p. 20).

Soda Ash and Other Sodium Compounds.—Trona, a naturally occurring mineral, is processed to yield soda ash. One hundred short tons of trona can yield approximately 69 short tons of soda ash (Wyoming Mining Association). The process involves calcining heating to approximately 130° C, followed by a refining procedure, which includes dissolution, removal of impurities and insolubles, recrystallization, and drying. Approximately one-half the soda ash produced in Wyoming is used in glass manufacturing (to lower the melting temperature of silica sand), about 25% is used in chemical manufacturing, and the remainder is used for soaps and detergents, pulp and paper production, flue gas desulfurization, water treatment, and other processes (Kostick, 2006; Wyoming Mining Association, 2001§[4]).

Continuing as the world's largest producer of trona and natural soda ash, Wyoming produced approximately 5% more trona in 2004 than in 2003. Since 2003, China has been the world's largest producer of soda ash overall, but produces synthetic soda ash, which costs more to manufacture and creates more environmentally harmful wastes (Kostick, 2006).

Other Industrial Minerals.—Black Hills Lignite, LLC, produced leonardite from its mine in Converse County near Glenrock. It produced 40,600 t (44,800 short tons), an increase of more than 25% from 2003 production. Rich in humic acid, leonardite is useful as a thinner in drilling mud and also as a fertilizer ingredient (Black Hills Bentonite, LLC, 2004§).

[4]References that include a section mark (§) are found in the Internet References Cited section.

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Black Hills Bentonite, LLC, 2004, Black Hills Bentonite, LLC, accessed August 10, 2006, via URL http://www.bhbentonite.com.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,340	145,000	3,420	148,000	3,510	151,000
Common	33	446	25	55	49	107
Gemstones	NA	12	NA	13	NA	13
Sand and gravel, construction	7,710	32,100	8,290	36,400	10,200	40,100
Stone, crushed	4,450 r	20,500 r	5,020	22,600	7,150	34,500
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, zeolites (2004)	XX	806,000	XX	792,000	XX	819,000
Total	XX	1,000,000 r	XX	999,000	XX	1,040,000

rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
WYOMING: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value	2003 Number of quarries	2003 Quantity (thousand metric tons)	2003 Value (thousands)	2003 Unit value	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value
Limestone[2]	12	1,740 r	$7,780 r	$4.48 r	10	1,780	$8,250	$4.64	10	2,900	$14,700	$5.09
Granite	1	W	W	4.71	1	W	W	4.74	1	W	W	4.74
Marble	1	W	W	4.13	1	W	W	4.41	1	W	W	4.41
Traprock	1	W	W	3.86	8	W	W	2.76	8	W	W	2.76
Volcanic cinder and scoria	1	W	W	3.87	1	W	W	5.34	1	W	W	5.33
Miscellaneous stone	2	92	481	5.24	1	295	1,550	5.24	1	1,430	7,510	5.24
Total or average	XX	4,450 r	20,500 r	4.60 r	XX	5,020	22,600	4.50	XX	7,150	34,500	4.82

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3a
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch):			
Macadam	W	W	$10.80
Riprap and jetty stone	W	W	11.03
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.72
Bituminous aggregate, coarse	W	W	6.17
Fine aggregate (-⅜ inch), screening, undesignated	W	W	2.37
Coarse and fine aggregates, graded road base or subbase	W	W	2.95
Chemical and metallurgical, cement manufacture	W	W	4.39
Unspecified:[2]			
Reported	2,630	$12,600	4.79
Estimated	590	2,900	4.93
Total or average	3,210	15,500	4.81
Grand total or average	5,020	22,600	4.50

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 3b
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	$12.39
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.78
Bituminous aggregate, coarse	W	W	7.17
Railroad ballast	W	W	4.76
Coarse and fine aggregates:			
Graded road base or subbase	W	W	2.90
Other coarse and fine aggregates	49	$712	14.53
Chemical and metallurgical, cement manufacture	W	W	4.41
Unspecified:[2]			
Reported	3,610	17,800	4.94
Estimated	1,300	6,900	5.21
Total or average	4,920	24,700	5.01
Grand total or average	7,150	34,500	4.82

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4a
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 2		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	--	--
Coarse aggregate, graded[4]	W	W	--	--
Fine aggregate (-⅜ inch)[5]	W	W	--	--
Coarse and fine aggregate[6]	W	W	581	1,600
Chemical and metallurgical[7]	W	W	--	--
Unspecified[8]				
Reported	2,330	11,000	295	1,550
Estimated	290	1,600	300	1,300
Total	3,850	18,200	1,170	4,450

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone was produced in District 1.
[3]Includes macadam and riprap and jetty stone.
[4]Includes bituminous aggregate (coarse) and concrete aggregate (coarse).
[5]Includes screening (undesignated).
[6]Includes graded road base or subbase.
[7]Includes cement manufacture.
[8]Reported and estimated production without a breakdown by end use.

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TABLE 4b

WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 2		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	--	--
Coarse aggregate, graded[4]	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W
Chemical and metallurgical[6]	W	W	--	--
Unspecified:[7]				
Reported	2,170	10,300	1,430	7,510
Estimated	1,000	5,600	300	1,300
Total	4,840	24,100	2,310	10,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone was produced in District 1.

[3]Includes riprap and jetty stone.

[4]Includes bituminous aggregate (coarse), concrete aggregate (coarse), and railroad ballast.

[5]Includes graded road base or subbase and other coarse and fine aggregates.

[6]Includes cement manufacture.

[7]Reported and estimated production without a breakdown by end use.

TABLE 5a

WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	713	$4,710	$6.60
Asphaltic concrete aggregates and other bituminous mixtures	642	6,000	9.35
Road base and coverings[3]	1,810	8,700	4.81
Fill[4]	263	938	3.57
Other miscellaneous uses	3	31	10.33
Unspecified:[5]			
Reported	2,260	5,410	2.39
Estimated	2,600	11,000	4.08
Total or average	8,290	36,400	4.39

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes filtration, railroad ballast, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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TABLE 5b
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	981	$6,560	$6.68
Asphaltic concrete aggregates and other bituminous mixtures	643	5,140	8.01
Road base and coverings	2,630	9,500	3.61
Road and other stabilization (cement)	211	596	2.82
Fill	105	412	3.94
Snow and ice control	30	86	2.91
Other miscellaneous uses	24	258	10.53
Unspecified:[3]			
Reported	1,290	2,710	2.10
Estimated	4,200	15,000	3.52
Total or average	10,200	40,100	3.95

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6a
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	210	2,080	504	2,630	--	--
Asphaltic concrete aggregates and road base materials[3]	1,610	11,100	837	3,630	--	--
Fill[4]	126	367	137	571	--	--
Other miscellaneous uses	3	31	--	--	--	--
Unspecified:[5]						
Reported	297	991	1,290	3,290	681	1,130
Estimated	700	2,800	1,900	7,800	--	--
Total or average	2,940	17,300	4,670	17,900	681	1,130

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration, railroad ballast, and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6b
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	422	3,500	559	3,060	--	--
Asphaltic concrete aggregates and other bituminous mixtures	382	3,370	261	1,770	--	--
Road base and coverings[3]	1,210	4,870	1,630	5,230	--	--
Fill	62	300	42	112	--	--
Other miscellaneous uses[4]	26	104	28	240	--	--
Unspecified:[5]						
Reported	12	72	290	1,000	988	1,630
Estimated	1,200	4,700	3,100	10,000	--	--
Total or average	3,280	16,900	5,880	21,600	988	1,630

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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Map Mineral Symbols[1]

Abr	Abrasives
Ag	Silver
AgLime	Agricultural lime
Al	Aluminum plant
Ala	Alumina
Asb	Asbestos
Au	Gold
B	Borates
Ba	Barite
BC	Ball clay
Be	Beryllium
Bent	Bentonite
Br	Bromine
Bruce	Brucite
Bx	Bauxite
CaC	Calcium carbonate
Cd	Cadmium
Cem	Cement plant
CFA	Chrome ferroalloy plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
D-D	Dimension dolomite
D-G	Dimension granite
D-L	Dimension limestone
D-M	Dimension marble
D-Q	Dimension quartzite
D-Sd	Dimension sandstone
D-Sl	Dimension slate
D-Sp	Dimension soapstone
Do	Dolomite
Dia	Diatomite
DS	Dimension stone
Em	Emery
F	Fluorspar
FA	Ferroalloys plant
FC	Fire clay
Fe	Iron
Fel	Feldspar
FePig	Iron oxide pigments
Fs	Ferrosilicon
Ful	Fuller's earth
Gar	Garnet
Ge	Germanium
Gem	Gemstones
Gil	Gilsonite
Gr	Graphite plant
GS	Greensand
Gyp	Gypsum
Gyp-s	Synthetic gypsum
He	Helium
Hg	Mercury plant
I	Iodine
IS	Industrial sand
ISG	Industrial sand and gravel
Jd	Jade
K	Potash
Ka	Kaolin
Ky	Kyanite
Leo	Leonardite
Li	Lithium carbonate
Li	Lithium plant
Lime	Lime plant
Mg	Magnesium
MgCp	Magnesium compounds
Mica	Mica
Mn	Manganese dioxide plant
Mo	Molybdenum
Mul	Synthetic mullite plant
Nabic	Sodium bicarbonate
NaC	Sodium carbonate
Nb	Columbium (niobium)
Nb/Ta	Columbium (niobium) and tantalum plant
Ni	Nickel
Nsal	Natural salines (CaCl)
O	Olivine
Opal	Precious opal
P	Phosphate rock
Pb	Lead
Peat	Peat
Per	Perlite
Pt-Pd	Platinum/palladium
Pum	Pumice and pumicite
Pyrp	Pyrophyllite
QC	Quartz crystal
RE	Rare earths
S	Sulfur
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SaCp	Saline compounds
Salt	Salt
Sb	Antimony
SG	Construction sand and gravel
Sh	Shale
Shell	Shell
Si	Silicon metal plant
Slag	Slag
SS	Sodium sulfate
Steel	Steel plant
Talc	Talc
Ti	Titanium minerals
TiMet	Titanium metal plant
TiPig	Titanium dioxide pigment plant
Trip	Tripoli
V	Vanadium
Vm	Vermiculite
Volc	Volcanic cinder
W	Tungsten
Wol	Wollastonite
Zeo	Zeolites
Zn	Zinc
Zr	Zirconium

[1]The maps in this report are intended to show by mineral symbols the location of significant nonfuel mineral mining or processing operations within each State in 2004. (An underlined symbol indicates a plant.) The symbols are not intended to show the location of every mine, quarry, and operation. Because there are about 13,000 nonfuel mineral operations in the United States, publication space limitations preclude the inclusion of a clear and legible map indicating all active operations. The U.S. Geological Survey's National Atlas, however, provides such data on the Internet at URL http://www.nationalatlas.gov. In most cases, a mineral symbol represents production of a significant quantity of a mineral. A symbol can indicate the location of a major mineral mining or processing operation, the location of a concentration of mining operations for a specific mineral, or the location of significant operations within a county. In some cases, however, a symbol may indicate a small operation that is significant because the mineral is uncommon or unique within the State or the Nation. Where there is an extensive geographic area with a significant concentration of similar operations, a dashed line defines the area.

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